JUNE, 1956

American Engineer

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By HARRY C. BROCKEL,

Member, Advisory Board, St. Lawrence Seaway Development Corporation

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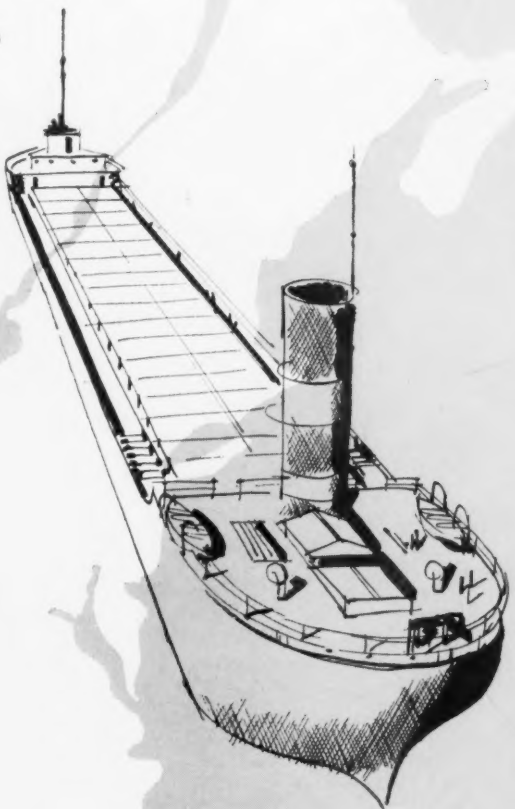
- Getting Round Pegs Into Round Holes
- Capitol Hill Testimony . . . Late News Items



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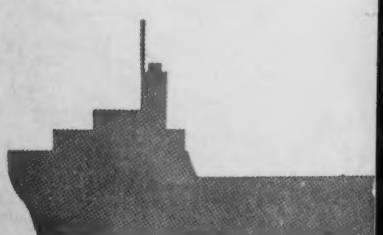

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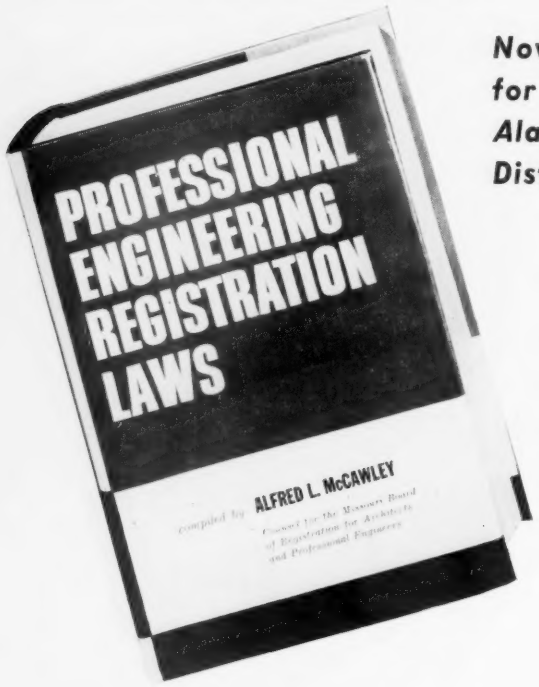

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The Author

Alfred L. McCawley, a Missouri State Senator for many years, is the author of numerous published articles on professional registration for engineers and architects. A sponsor of the Missouri securities law, he is counsel for that State's Board of Registration for Architects and Professional Engineers. His legal career dates back to 1900, when he was admitted to the Missouri Bar.

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But why MEN over 45?

Our doctors still don't know *why,* but if you are a man over 45 you are six times as likely to develop lung cancer as a man of your age twenty years ago. They *do* know, however, that their chances of saving your life could be about *ten times* greater if they could only detect cancer long before you yourself notice any symptom. (Only 1 in every 20 lung cancers is being cured today, largely because most cases progress too far before detected.)

That's why we urge that you make a habit of having your chest X-rayed every six months, no matter how well you may *feel.* The alarming increase of lung cancer in men over 45 more than justifies such precautions. Far too many men die *needlessly!*

Our new film "The Warning Shadow" will tell you what every man should know about lung cancer. To find where and when you can see this film, and to get life-saving facts about other forms of cancer, phone the American Cancer Society office nearest you or simply write to "Cancer"—in care of your local Post Office.

American Cancer Society

Letters to the Editor

'Professionalism' Stories . . .

Dear Editor:

May I suggest that upon the conclusion of the series, "Professionalism in Industry," all the articles be assembled into a single booklet?

These articles are too good and too full of meat to be accorded less treatment. . . .

WM. C. BURNETT, P.E.,
Birmingham, Ala.

Flight of Fancy? . . .

Dear Editor:

After reading with interest the article, "The American Community and the 'Growth Profession'," by Boyd Campbell (April issue) I was startled by statements which deserve the engineer's full and critical attention, and which I must challenge.

I quote Mr. Campbell: "[Your community] needs you . . . cities usually have full-time engineers. . . . But isn't it altogether probable that in thousands of cases, the community needs more engineering counsel than it can possibly afford? . . . you may find yourselves working for nothing. What is so bad about that?" . . .

The engineer's education, training, knowledge, experience, reputation, and skill which are so casually and freely proffered "for nothing" (by a non-engineer) are his stock in trade. . . .

An engineer, in offering his services "for nothing" to a community which has a full-time staff engineer, or engineers, is discrediting, in competition with, and cheapening the value of such engineer's services—in effect, supplanting him. If the community does not have a staff or full-time engineer, an offer of free services is undermining the practice of other practicing engineers who set a reasonable value upon their work and services. *Such practice as advised is definitely counter to the most elementary codes of ethics.*

No matter how well intentioned, such extravagant flights of fancy as Mr. Campbell's advice to engineers to proffer free services are to be condemned and discouraged. They will definitely damage whatever professional status the engineer now has in public estimation.

ERIC FLEMING, P.E.,
New Brunswick, N. J.

Management Roughspots . . .

Dear Editor:

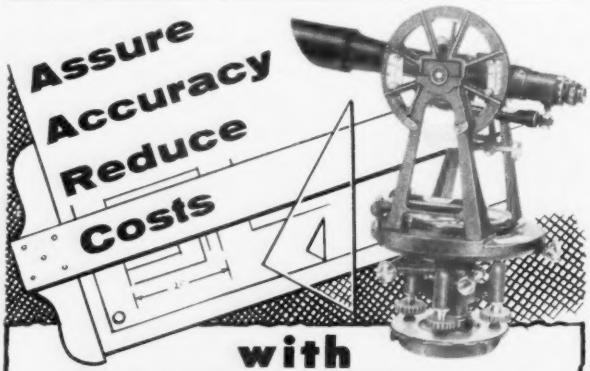
I just found time to read the March issue of our very excellent magazine, the AMERICAN ENGINEER.

I have finally found one man, Herbert R. Northrup, with enough courage to really let management know the crux of the engineer-shortage problem.

What most interested me was his remark relative to pay for engineers so that they would not become salesmen. For here is one who did leave the fold to become a salesman.

The reason may interest some of the top management men who are P.E.'s and may help them to prevent their men from leaving. When plant politics get tight and men without qualifications or age are rewarded with key posts, either a man remains and becomes just another body, or if he has courage he takes off. In my case I felt it was of no use to go back to plant work and have a chance for this to occur again. So, off to sales work where all the people of management are interested in, is your ability to increase sales, and your wages, too.

Now, after doing this work for three years, and observing many other companies from the outside, I wonder how some of them stay solvent. Being an outside man I am



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treated as the father confessor and could, if there were a way, smooth out many rough spots in management for my customers. However, I am sure that in most cases top management would not believe that unrest exists in their organization.

It is the duty of management to anticipate the thoughts of its employees, like a good helper always has the tools ready for his journeyman.

One of the best ways is for management to survey their former employees and use their reasons as a basis for corrections. Similar to the servo valve technique that is used today.

(Name withheld by request)
Brookline, Mass.

Retirement Troubles . . .

Dear Editor:

I have read with interest Mr. F. S. Frambach's letter to the editor in the March issue of the AMERICAN ENGINEER.

I will be 65 years old this month. My health is good and I expect to continue working, but I do think something should be done to help the engineer after he reaches retirement age. I cannot see any reason why the earnings of one should be limited after retiring. Most of us who have reared a family have had a struggle to get the job done, and then when the family is gone, we have fewer dependents and our income tax is increased so that there is no way to save for old age. I feel that if the earning restrictions were removed, we could retire on our social security allowance. As it is I do not see how anybody can retire voluntarily and maintain a respectable living standard.

I do not know what the solution can be. I have written my congressman but they hold out little hope for the immediate future. Perhaps we need a national organization of engineers of 65 years of age or older, to fight for our interests.

I agree with Mr. Frambach's closing statement, "Unless this situation is changed, the ballyhoo about a shortage of engineers is ludicrous!"

HARRY A. MARSHALL, P.E.
Topeka, Kansas

Button, Button . . .

Dear Editor:

The article, "Toll System Works While Vehicles Are In Motion," (AMERICAN ENGINEER, April 1956, page 38) is fascinating. The most striking feature of the machine which is discussed in the article is that it is smarter than the attendant. However, it seems unreasonable to give the attendant several buttons to push for, by pushing the wrong one, he can cause the machine to lock, thus preventing it from performing functions which it knows very well how to do, frustrating the machine, embarrassing the attendant and delaying the truck.

At first thought it might seem more reasonable to provide one button. The machine already knows how many axles there are—in fact, it knows better than the operator does (one would think that he could count as high as ten unless he has lost fingers). Then on second thought the operator could also fail to push that one button. He has already demonstrated that he is fallible. Why not leave it to the machine to use its knowledge of the presence of the truck to punch the button, apply its knowledge of the number of axles to push the proper key, then deliver the card by chute to the

(*Continued on page* 31)

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PROFESSIONAL NEWS IN CAPSULE FORM

A Roundup of Late Events for Professional Engineers

J. T. Reid Named ASME Research Manager

John Thomas Reid, East Orange, N. J., has been named research manager of The American Society of Mechanical Engineers.

His duties will include staff service for the Society's various research committees, co-ordination and assistance in fund-raising for research projects, and liaison with the Engineering Foundation and the National Research Council.

⚙

Carnegie Tech Survey Shows Engineer Grads in Many Fields

A recent survey by the Carnegie Institute of Technology in Pittsburgh shows that a majority of its science and engineering graduates are functioning in the higher echelons of administration and management.

A total of 2,391 graduates listed their profession as engineering in response to a survey questionnaire sent out to some 18,000 alumni of the school. An analysis of the questionnaire returns indicates that engineer graduates have chosen careers in the fields of editing, sales, education, medicine, law and politics.

⚙

Jacksonville District Announces Urgent Personnel Needs

Civilian engineers of practically all categories are urgently needed to fill Corps of Engineers position vacancies in the Jacksonville, Fla., District

An announcement from the District's personnel officer states that Civil Service registers of eligible employees have been exhausted in the more critical classification and that vacancies would be filled without assembled examinations.

"We will give immediate employment to qualified engineers in the fields of hydraulics, structural, civil, electrical, mechanical, and architectural engineering," the personnel officer stated. The announcement emphasized that while the work is under the Army Engineers, the positions are entirely civilian and can lead to career Civil Service status with its attendant employment benefits.

⚙

Idaho Engineer Shares Award For Pend Orielle Bridge

Alfred J. Sachse, senior resident engineer for the state highway department at Coeur d'Alene, Idaho, was named co-winner of the Dr. L. I. Hewes Award at the annual conference of the Western Association of State Highway Officials in Phoenix, Arizona.

The reward was in recognition of his achievements in connection with the design and construction of the 5,897 foot concrete bridge over the Pend Orielle River on U. S. 95 at Sandpoint, Idaho.

Sachse, who is a member of the Idaho Society of Professional Engineers and NSPE, will share the $500 cash award with Robert O'Connell, traffic engineer for the Wyoming highway department.

⚙

Gen. Prentiss Urges Speed in New Highway Program

"The first and most substantial task at hand is to give all possible aid and impetus to the establishment of a vast new road building program to be based on the principle of Federal aid to the states," Maj. Gen. Louis W. Prentiss (USA Ret.) said as he took over his duties as executive vice president of the American Road Builders' Association.

The General stated that his primary purpose would be to "uphold ARBA's traditional objectives and at the same time try to broaden both its membership base and its capacity for service to all branches of the highway industry."

He pointed out that he felt the recent House action in approving a 51-billion dollar, 13-year Federal-aid highway construction program was a tremendous forward step. "ARBA, within its prescribed scope of service, will lend all possible assistance in bringing this sorely-needed national program to prompt fulfillment," he said.

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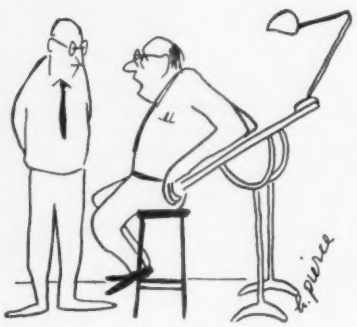

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***To arrange confidential interview, send resume to Box 601, AMERICAN ENGINEER.**

Princeton Engineering Chairman Named Chief Scientist For Air Force

Prof. Courtland D. Perkins, chairman of the department of aeronautical engineering at Princeton University, has been appointed as chief scientist of the Air Force.

The announcement of his appointment was made recently by Gen. Nathan F. Twining, Air Force Chief of Staff, at the spring meeting of the Scientific Advisory Board at Elgin Air Force Base in Florida.

Prof. Perkins teaches at both the graduate and undergraduate levels, and he conducts basic research in the area of airplane stability and control at extremely high speeds. He will be on leave from the Princeton faculty while serving as chief scientist.

Special Team Reviews Atomic Energy Documents

The Atomic Energy Commission has announced the completion of review of 30,773 research and development reports and informal memoranda in a stepped-up program to make more information available to private industry.

The review work, aimed at declassifying or downgrading a large accumulation of reports of potential use in the atomic energy industry, was done at the Commission's Oak Ridge, Tenn., office by a team of 35 scientists and engineers.

Of the 30,773 reports reviewed, 10,916 were declassified, 8,574 were labeled "confidential," and 11,283 remained in the "secret" classification.

Declassified reports go into the open scientific literature, and are available without restriction to all who wish them. Classified reports will be sold to qualified access permit holders through the AEC's Technical Information Service at Oak Ridge.

The AEC also announced that separate "Report Announcement Bulletins" are being issued covering secret, confidential, and declassified documents.

Dravo Employees Win Technical Papers Awards

Cash awards totaling $1,200 went to seven employees who authored winning entries in Dravo Corporation's 17th annual technical papers competition. Presentations were made at the annual spring social of the Dravo Engineers Club, held recently in the firm's cafeteria in Pittsburgh.

C. W. Granacher, project engineer

(*Continued on page 39*)

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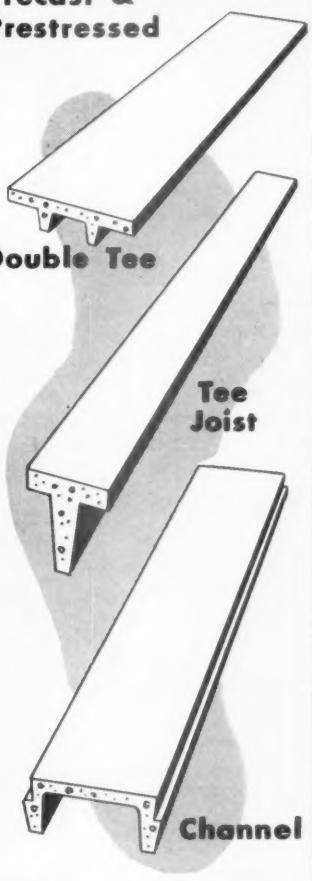

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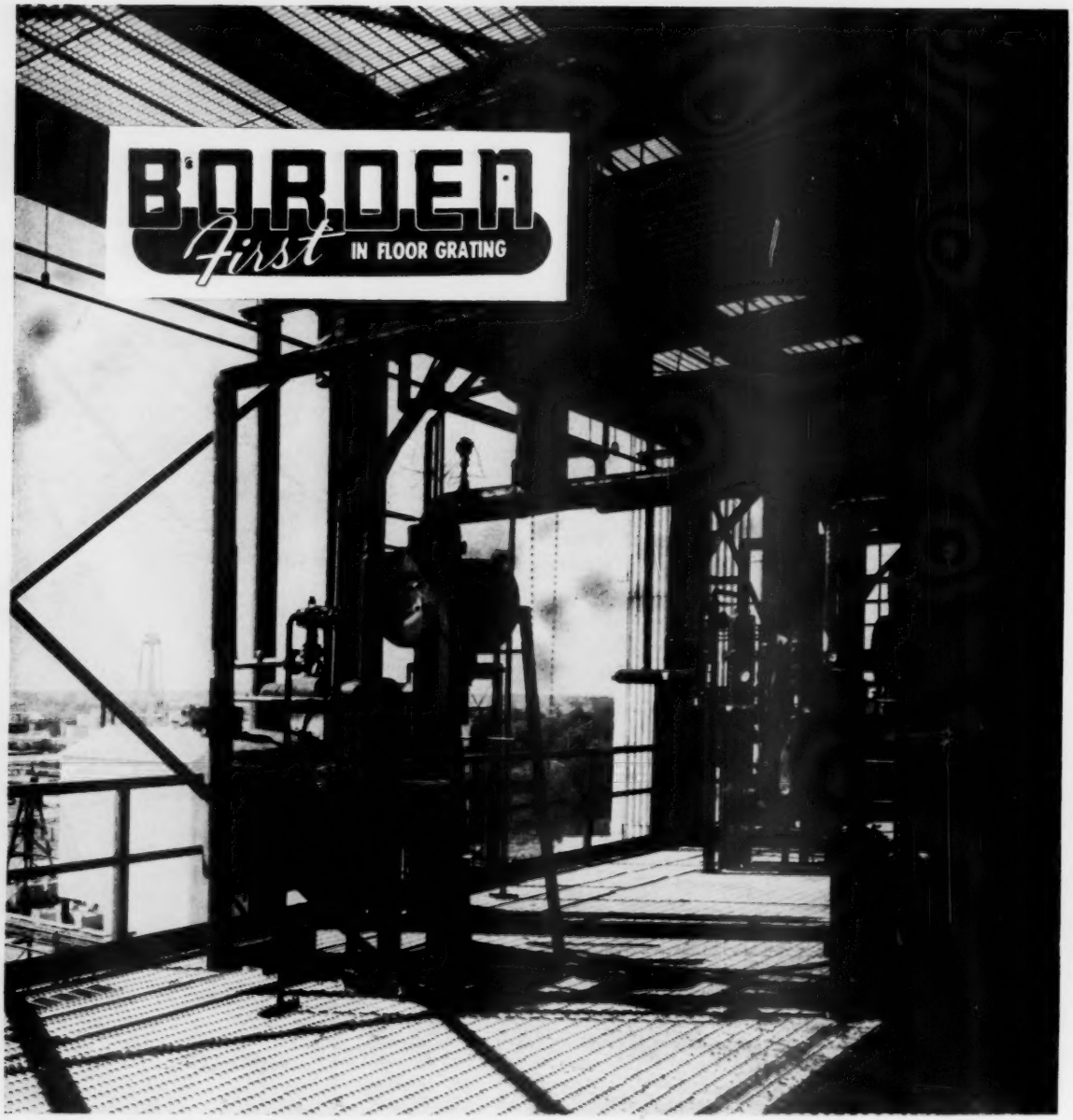

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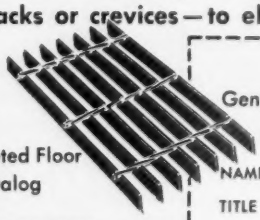

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American Engineer

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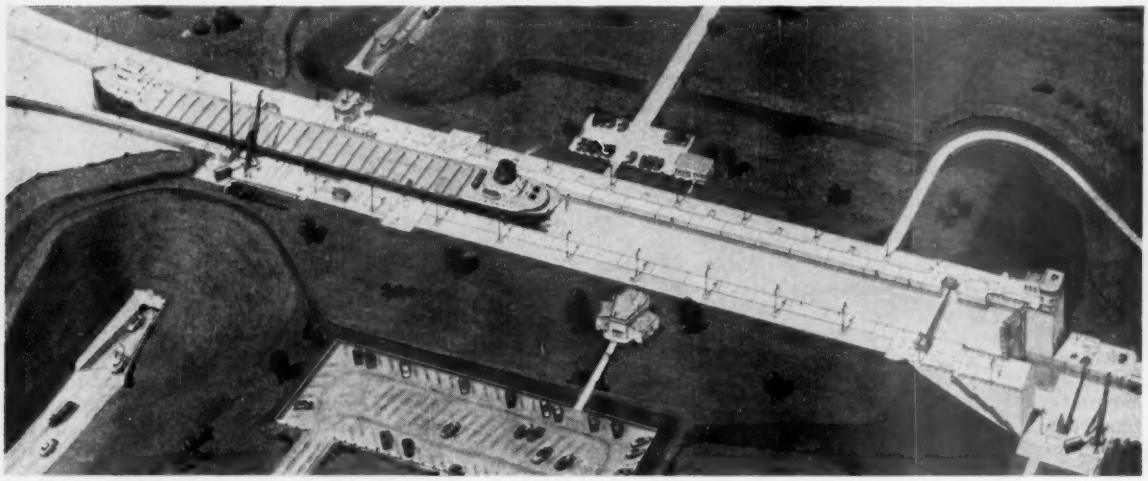
VOLUME TWENTY-SIX NUMBER SIX

ENGINEERING science is performing plastic surgery on the face of the North American continent. The St. Lawrence Seaway and Power project, one of the greatest engineering undertakings of all times, is well under way. It will create the longest deep-draft waterway in the world—the St. Lawrence Seaway—penetrating the North American continent 2400 miles from the Atlantic, into the industrial and agricultural heartland of America. It will harness the largest undeveloped source of water power in North America.

The St. Lawrence project is one of the biggest engineering enterprises yet attempted. It is also one of the most complex, requiring close coordination of construction water levels and velocities to balance the requirements of navigation and power. The fact is that a billion dollars of new engineering works is rapidly taking shape in the St. Lawrence River Valley and in the Great Lakes region. Canada and the United States together will spend upward of $300,000,000 on new locks, canals, and dredging of channels, to provide a 27-foot system of navigation from Montreal to Chicago and Duluth. The power authorities of New York and Ontario are investing between $500,000,000 and $600,000,000 in their power undertakings. The U. S. Congress has authorized the Corps of Engineers to spend $115,000,000 to extend a uniform 27-foot system of navigation from Lake Erie, up through the Detroit River, St. Clair River, Lake St. Clair, the Straits of Mackinac, and the St. Mary's River, between



This lock at Robinson Bay near Massena, N. Y., has been officially named the Eisenhower Lock. The $20,000,000 project is scheduled to be ready for final testing by June 1, 1958. The lock will be 860 feet long, 80 feet wide, and will have a maximum lift of 49 feet. Note the highway traffic running through a tunnel under the lock.

The Seaway Story—the Beginning of a New Era

By HARRY C. BROCKEL,

Member of the Advisory Board, United States Seaway Development Corporation

Channel excavation and dyke building are necessary in the Montreal area of the Canadian section of the Seaway. Many engineering studies were made before construction contracts could be awarded.

Huron and Superior. The significance of the "connecting channels project" is that, without this work, a 27-foot St. Lawrence Seaway would extend only to Lake Erie, with Toledo as the most westerly seaway port. The presently available 21-foot upbound, 25-foot downbound system of channels would severely limit lake and ocean shipping capacity moving from Lake Erie up into Lakes Huron, Michigan, and Superior. Lake ports from Toledo west would be less fortunately situated than the ports of Lake Ontario and Lake Erie.

Other tens of millions of dollars are being spent, or are projected for spending, by port authorities on all five Great Lakes, to provide modern cargo handling facilities and port terminals for the anticipated flood of new traffic from the seven seas. An unknown factor in these equations are the anticipated tens or hundreds of millions of dollars which may be spent in industrial expansion in the Great Lakes area, to take advantage of Seaway facilities for importation of raw material and for export of finished goods.

The Corps of Engineers of the U. S. Army is acting as design and construction agent for the St. Lawrence Seaway Development Corporation. During the long years, while the St. Lawrence project was debated in the political assemblies of both countries, the engineering agencies of both governments, and the power authorities of New York and Ontario, continued with advance engineering studies and design work, to the extent that their authority and available funds permitted. In spite of the vast uncertainty which hung over the entire project for fifty years, the preparation of advance engineering and design data was so effectively accomplished, that within weeks after the Presidential signature dried on the Wiley-Dondero Bill, contracts were being awarded, and men and equipment were mobilizing along the entire valley of the St. Lawrence River.

Thanks to vastly improved construction techniques and more efficient equipment, the time requirements for construction, originally estimated to be seven years, have now been speeded up to such a degree that the Seaway authorized in May, 1954, will be functioning in April, 1959, with only about four and one-half years of actual construction work indicated. The people of the United States and Canada are indebted to engineering science and know-how, in that the economic benefits of the project will accrue to both countries, and to world trade, about three years sooner than originally anticipated.

The Library of Congress recently prepared a chronology of the long history of the St. Lawrence River. It goes back to 1783, when the first canal was built between Lake St. Francis and Montreal, to take fur trading bateaux safely around the turbulence of the Lachine Rapids. Woven through the hundreds of events listed in the chronology between 1783 and 1956, are scores of reports and studies by the Canadian Government, the American Government, Canadian provinces, the State of New York, and private agencies. Forming a dominant part of the fabric, are scores of engineering studies and reports.

In 1832, there was published in Canada an essay by a citizen now unidentifiable, urging a ship canal to make Great Lakes ports accessible to the sea. The essay was signed "A. Projector," presumed to be a pseudonym. Whoever "A. Projector" was, he stands in history as the father of the St. Lawrence Seaway project, and as possessed of a vision, not to be realized for 130 years

Construction and commerce go on side by side in the International Rapids Section in the vicinity of the St. Lawrence Power Dam being constructed jointly by the Power Authority of the State of New York and the Hydro-Electric Power Commission of Ontario.

after, but destined to stand as a monument to engineering science, as one of the greatest public works of all times, and as a vital factor in world trade and continental development.

The first engineering report of record was rendered in Canada in 1834, to the Province of Ontario. Civil Engineer J. B. Mills recommended that the province proceed at once with canalization of Canadian waterways. The Royal Engineers of Canada subsequently rendered report, as did engineers of the Department of Public Works, and of other Canadian Governmental departments.

Heavy tonnage ocean-going vessels will soon have a clear channel through the broad but treacherous St. Lawrence River.

In 1888 the U. S. Army engineers made a survey of possible routes on the American side of the boundary, to connect Lakes Erie and Ontario, and to surmount Niagara Falls. Space does not permit an adequate listing of the many engineering surveys and reports which were continuously in process from 1834 to the present time.

Herbert Hoover, that eminent figure in the engineering profession, became a proponent of the St. Lawrence Seaway project in 1920. As an engineer, as a member of the Cabinet, and as President, he continued to advocate the St. Lawrence development.

One of the greatest names in engineering, that of Hugh L. Cooper, is intimately associated with the history of the St. Lawrence. In 1920, Cooper's company made a report to the International Joint Commission, recommending development of navigation and power in the St. Lawrence. The Cooper plan would have cost an estimated $1,450,000,000. It called for five dams developing 6.6 million horsepower. The report, on behalf of a syndicate of power companies, offered to provide the navigation facilities free to the Governments of United States and Canada in return for power rights in the river. It is interesting to speculate on what the course of history might have been, had this offer been accepted, and had the St. Lawrence project been operative since 1925.

Economists, statesmen, public officials, writers, politicians, administrators, visionaries, and plain John Q. Citizen, on both sides of the border, all have played important parts in the long studies and controversy which led gradually to public acceptance of the St. Lawrence project. Dominantly, however, the project will stand as a tribute to the efforts, the study, and the know-how of professional engineers—civil, mechanical, electrical, and hydraulic.

It stands as one of the greatest testimonials to the vision and the technical and professional abilities of the U. S. Corps of Engineers. Great credit is due the Corps and the various chiefs of engineers, who since 1920 have continuously advocated the Seaway for the economic service and the national defense of Canada and the United States. The rapid progress in construction of the Seaway project can be largely credited to the Corps of Engineers, which continuously developed and maintained comprehensive engineering and design data, which was immediately available for utilization following Congressional action.

Aerial view of the Long Sault spillway dam construction along the Seaway near Massena, N. Y. This dam is being built by the Power Authority of the State of New York.

The magnitude of the engineering projects involved in the Seaway construction is indicated in this excavation work on part of the channel in the Lachine section near Montreal.

Power development is a major engineering activity in the St. Lawrence Seaway project. This photograph shows one of the largest power site excavations on the U.S. side.

Similar advance engineering in Canada came from continuous accumulation of engineering data, model studies of the St. Lawrence by the Ontario Hydro-Electric Commission, and by Canadian Federal agencies. When Canada created the St. Lawrence Seaway Authority in 1952, she indicated not only her determination to proceed with the project but her confidence that her advance engineering made immediate action feasible. Canada's determination to build the Seaway broke the log-jam in the American Congress, and was a vital factor in Congressional and Presidential authorization of the Seaway undertaking, although a rising tide of public support and public opinion was apparent on this side of the border, particularly with the discovery of the new Labrador iron range, coupled with public awareness of the approaching depletion of the Mesabi Range and other upper Great Lakes iron ore deposits.

Outstanding figures in the American engineering profession are translating the St. Lawrence Seaway and Power Project from the blueprint stage to reality. A well-known civil engineer, Martin W. Oettershagen, former Harbor Engineer of Chicago, is deputy administrator of the St. Lawrence Seaway Development Corporation and is the right-hand man of the Administrator, the Hon. Lewis G. Castle, who heads the Corporation. Chief engineer of the Corporation is Raymond F. Stellar, who as a civilian specialist of the U. S. Corps of Engineers is recognized as the leading authority in the Federal Government on the Seaway.

Other leading engineering figures on both sides of the border are directing the power and navigation developments for the St. Lawrence Seaway Authority of Canada at Ontario Hydro-Electric Commission and the New York State Power Authority.

The Seaway is another example to the world of how professional engineering abilities make for continued progress. The Seaway and Power project will make a significant contribution to national defense, and will further the economic development of many areas. As an engineering undertaking, as a transportation facility, and in its national defense aspects, it is in every respect comparable to the Panama Canal, which has so vitally aided world trade, and has so greatly added to North American continental defense.

With completion of the power and navigation works of the St. Lawrence project in 1959, a new era in world shipping and international relationships will begin. Great Lakes freighters and ocean going ships will move freely up and down the St. Lawrence, linking lake ports with many of the world's leading trade areas. The impact upon world trade, shipping, and international relations will be so considerable, that to try to define it in absolutes would take much temerity. Assuming, however, normal trade conditions and a sustained period of peace, the effect of the Seaway upon world shipping and trade is bound to be very substantial.

Industrial expansion in Canada and the United States, and probably in parts of New England, may be anticipated from the power development, which will provide the largest undeveloped block of power in all North America.

The expenditure of a billion dollars in engineering works in a four and one-half year period is in itself no

(*Continued on page 46*)

Engineering Employment Practices

Digest

A short digest of a monthly bulletin published by the National Society of Professional Engineers in the interest of advancing cooperative relations between professional engineers and their employers. To regularly receive the complete publication which is distributed widely to industrial, commercial and educational organizations, write the NSPE, 2029 K St., N.W., Washington 6, D. C.

✓ A salary survey of chemical engineers and chemists by the American Chemical Society discloses an employment shift toward technical administration, the highest-paying category. For chemical engineers, the per month medians for 1955 were reported as: administration, technical, $898; research, industrial, $647; production, $654; research in basic science, $602; development, $613; teaching, college or university, $637; analysis and testing, $520. Comparisons between 1955 and 1941 show employment in technical administration rose from 15 per cent to 20 per cent, analysis and testing dropped from 13 per cent to 8 per cent, and college teaching was down from 12 per cent to 9 per cent.

The survey confirms that earnings increase generally for higher degrees—with two years of experience, chemists with a B.S. trail those with a Masters' degree by about $50 per month, and holders of doctorates earned almost $150 per month more than the Masters. Median salary for chemical engineers with four years of experience was slightly above $500 per month; for chemists, $490—although a larger portion of the chemists have advanced degrees.

✓ Other economic data from various sources reports offering price for recent graduates at about $450 a month, but an engineer leaving college with a Doctor's degree "can find $10,000 to $12,000 jobs without too much trouble." . . . median salary for project engineers, including assistant project engineers, is reported at $9,120. Full project engineers alone average $10,020 a year. These statistics, together with other data about the role of project engineers, are from a survey of 95 companies. . . . The Florida State Road Department has adopted a new state merit system with 185 job classifications, many of them significant to engineers. The engineering job salary ranges are from $500-625 per month to $800-1000 for the state highway engineer. The higher-paying engineering positions require state engineering registration . . . a university group in San Francisco says a salaried junior professional with a family of four needs $8,130 a year for a "commonly accepted" standard of living.

✓ *The recent convention of engineering unions (ESA) rejected affiliation with AFL-CIO and declined a suggestion for merger with the American Federation of Technical Engineers, AFL-CIO. The keynoter of the convention—Prof. Ben Aaron of USC—told the group they must eventually choose between joining the AFL-CIO or place more reliance on professional engineering societies. He said ESA has now gone about as far as it can in a quasi-union status. In other actions, the engineering unions voted to offer individual membership, subject to constitutional amendment; to publish a national salary directory for distribution to colleges; emphasize collective bargaining organization for civil engineers; and support legislation for a separate classification system for federally-employed engineers.*

✓ In a recent talk to company personnel people, S. C. Moody, vice president-personnel, American Cyanamid Co., said the professional employee is distinct from either 'management' or 'labor.' Moody said the professional needs the managerial outlook, but his primary function is not to manage. He outlined the objective of providing professional employees with the "kind of rewards in dignity, appreciation, and compensation that will give him a satisfying and creative career in his field of competence." Moody stressed recognition of the fact that the professional can make as great a contribution in his specialty as in the field of management.

✓ Colin Carmichael, editor of *Machine Design*, says ". . . smart employers are going out of their way to provide for their engineers a physical environment favorable to creative effort."

James H. Taylor, industrial relations director, Procter and Gamble, poses seven points to industry, under the heading: "Are You Doing This to Your Engineers." Taylor's points, in effect, ask management if it expects professional thinking and performance without offering the necessary *quid pro quo*.

The National Industrial Conference Board has published, *Tuition-Aid Plans for Employees*, based on a survey of 166 company plans.

Professional Employment Practices:

The Consulting Office

By MURRAY A. WILSON, P.E.,

Owner and Director, Wilson & Company, Engineers & Architects

Here Is Another Story in Our Popular Series Dealing with Professionalism in Action. This Month We Are Proud to Present an Account of How a Leading Consulting Firm Makes Its Employees Members of the Team.

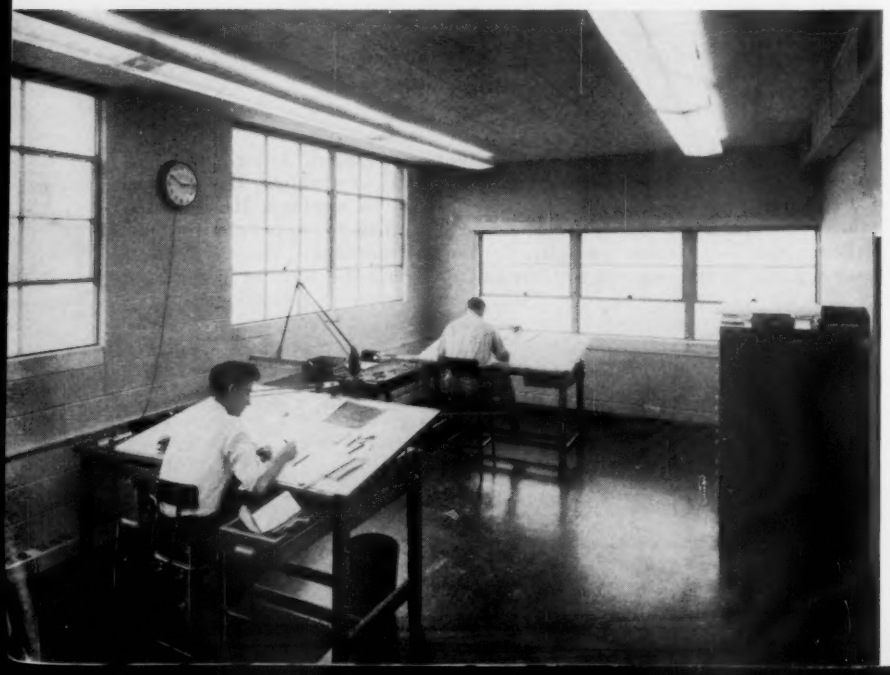
THE basic philosophy of our organization has always been that a group of engineers must have a sense of unity and a feeling that each and every one has a share in the problems, the responsibility, the credit, and the cash that may be derived from the operations. The organization had its beginning almost a quarter of a century ago when two engineers, both out of work in the depression of the early 30's, decided to share their efforts. The partnership continued until 1941 when the senior partner died and the surviving partner reorganized and continued the operations.

At the present time the type of work done covers a fairly broad field. As the organization grew and the projects became larger and more complex, additional specialists were added to cover the new fields involved in the work. Due to the geographical location of the home office and the absence of any other specialists in the immediate vicinity who could be called in to assist, it was found necessary to develop a group which could, within its own ranks, handle the problems which were of a recurring type, regardless of the field in which they occurred. At the present time our work consists of reports, estimates, detailed design, preparation of construction drawings, the writing and editing of specifications, and the supervision of construction. Our clients consist of municipalities, counties, units of state government, the Corps of Engineers, some of the commands of the Air Force, and some industrial concerns.

We divide our work by subject matter into 10 classifications, as follows:

Airports	Mechanical
Architecture	Sanitary
Chemistry	Streets and Highways
Dams and Flood Control	Structures
Electricity	Waterworks

An engineer, or in the case of architecture—an architect, is designated as the head designer of each of these sections or types of work. When a new project is received in the office, it is at once assigned to the head of that department and he is responsible for steering it through its various stages until the job is completed. In most cases a younger engineer is assigned to the department head as his principal assistant and shares with him the respon-



Ideal office conditions contribute greatly to good morale as well as better work and more production. More consulting engineers than ever now realize that it is simply "good business" to treat their engineers as true professionals.

—Photo by Doepke Co.

The author states that a spirit of unity and cooperation is essential within a group of engineers.

sibility of coordinating the work on the project and is in charge of it whenever the department head is absent from the office. The department heads handle most of the dealings with the clients.

Outside of the technical assignments just mentioned, the organization is as simple as possible. The general manager has the duty of coordinating the efforts of the different departments, serves as the personnel officer and also as contact man with some of the more important clients. The assistant general manager is his right hand man and divides with him the responsibility of looking after clients. He is the editor and coordinator on all contract forms and serves as manager in the absence of the general manager. The chief engineer provides general technical supervision to the department heads and designers and helps solve the technical questions as they arise. He keeps one eye on progress schedules and another on manpower and sees that work is completed on schedule and is of an acceptable quality, both as to form and content. His right hand man is the Chief Draftsman, who looks after the details of keeping the men at the drafting tables employed on the jobs where they are most needed. The department heads are also required to furnish all information necessary for the specifications, to assist the specification writers in assembling the proper data to interpret and supplement the drawings; so that the specification writers serve basically as editors.

As stated in the beginning, the organization was started with the thought firmly in mind that, as important as unity and cooperation may be in other lines of endeavor, it is indispensable in a group of engineers. It is becoming more so as the complexity of certain types of work increases and the need for specialists becomes greater each year. The thought has been emphasized and held up as an ideal before the group at all times, that the principle of the golden rule is the best guide to follow in business as well as in private life. In addition, we have followed the theory that a professional man works best when he is not hampered by too many rules. We have therefore held our written regulations, pertaining to personnel, to a minimum. Of course, to avoid confusion, there are certain rules which must be followed, but instead of trying to reduce to writing all the rules and regulations governing every phase of work and all possible situations, such as have grown up in many large organizations, we have kept these rules and regulations to a minimum and asked the men to meet each situation on its merits with the guidance of the two basic principles; namely, "Treat the other fellow as you would be treated"; and secondly, "What would you do in this case if you were paying for it out of your own pocket?" The safety feature of this type of operation is in the quality of men to whom such freedom of action is accorded. We believe that a man who cannot be trusted when left to his own devices has little chances of developing into a professional man; and repeated missteps will lead to an arrangement where the man is placed in a position where he can do no harm.

Every effort is made to encourage the development of the professional ideal among all the men, whether or not they are actually classed as professional engineers. Young men just out of school are urged and encouraged to enroll as engineers in training. As soon as one of these has completed the legal limit of experience, he is urged and encouraged to secure his license. Each man who answers correspondence signs his own name to the letter and each man responsible for the design of any part of a project affixes his seal to those sheets of plans which show the result of his design. Thus, on the more complicated projects, the seals of six or seven different design engineers appear on the appropriate sheets of the completed set. This serves to impress upon each man the responsibility which goes with working out a design and in making the decisions concerning it. It also inculcates a spirit of pride in the work and is a constant reminder of the value and meaning of an engineer's license.

The younger men are moved from one department to another as the urgency of a job may require and in this way they acquire an insight into the workings of as many different phases of the work as possible. Of course, the head of each department is usually occupied with matters directly connected with his chief responsibility, but even here there is sometimes a lull in one department to such an extent that the head of that department becomes an

Sometimes the head of a department must "help out" as an assistant to beat a deadline.

assistant in another department, helping his associate catch up with the timetable and beat a deadline. While this does not develop an expert in one line as rapidly as some people desire, it has the other advantage of giving the individual a much broader picture of engineering, gives him an insight into the other fellow's problems, and helps him to develop into an all around engineer. Personal preferences are taken into account as much as possible, and as soon as a man develops or demonstrates a particular knack for certain lines of work, or evidences a special interest in one phase of the work, care is taken to keep him in that field as much as possible. In this way men are developed to serve as assistants to department heads and have the opportunity of taking the lead when the retirement time comes for the older men.

THE use of titles is kept to a minimum. Each man's record is studied at least twice a year with the purpose of noting his progress and development and of determining his readiness for promotions. Usually promotions are made only once a year, except when new jobs arrive which call for a major reshuffling of personnel and occasionally the advancement of one man to take charge of a new operation.

First attempts at profit sharing were made about fourteen years ago and the effect was so satisfactory that, after trying out various methods and procedures, a formula was worked out which has been in use continuously for the past nine years. The plan consists in setting aside a definite and agreed upon share of the total profits before taxes as a dividend to be divided among all employees with more than six months' employment record. Of this amount set aside, thirty per cent is divided among the eligible employees in direct proportion to their basic salaries; thirty per cent is divided in proportion to the amount of overtime hours that have been expended during the year, less such actual overtime payment that has been made to the individual at regular pay periods; twenty per cent is divided in proportion to the length of service; and twenty per cent in proportion to the merit ratings of the employees which are derived from composite ratings made by all the department heads and supervisors. This plan has been satisfactory, both to employees and management. It has had the effect of helping maintain interest in the work, has given an urge to perform work economically and to help in the over-all economy of operation. There is no attempt at correlating the profitableness of any particular job to the individuals assigned to it, because the profitableness of a project is not always the direct result of the efforts of those performing the work. This eliminates any tendency of men to try to avoid working on a project which is foreseen to be an unprofitable one, and conversely eliminates any unnatural urge to be assigned to a project which may appear to the employees as having better chances of producing a nice surplus.

During the past year a detailed study of a number of retirement plans was made and the results were submitted to the employees at the close of the year with a recommendation as to the type of plan and the question of whether or not the employees favored its adoption. The result of the vote was favorable to the adoption of the plan, which will therefore be put in force at the end of the current year. In this plan a portion of the profits, instead of being paid directly in cash at the close of the year, will be placed in a trust fund and invested in proper securities. Each year the fund will be allocated to each individual in proportion to his total length of service. The factor in the formula for determining individuals' profit sharing that relates to length of service will hereafter be eliminated from the cash dividend, leaving only three terms in the formula instead of four. One of the principal inducements for this type of savings plan is the tax benefit which will go along with it, which will represent a considerable saving to the individual employee over a period of years. No attempt has been made to tie the retirement allocation to salaries or position, but rather to hold it strictly in proportion to length of service. It is estimated that the returns from the trust, coupled with a man's social security receipts, will provide the necessities of life after age sixty-five and all the members are urged to do their own saving to provide for the luxuries which they may feel they would like to have after their retirement begins.

OUR vacation program provides that each individual receives one week's vacation, due at the end of his first year of continuous service and each year thereafter until he has completed five years. Then he receives two weeks' vacation until he has completed fifteen years of service, after which he may take three weeks per year. It is anticipated that this will be increased to four weeks for those who have completed twenty-five years of service, as soon as any are eligible for that status.

Group insurance is available to all employees, half of which is paid by the company and the other half by the individual. Hospital and medical insurance is maintained through Blue Cross and Blue Shield, all of which is at the individual's expense.

Payment of regular wages is made at the end of each two weeks' period and an attempt is made to keep employees informed of items of common interest through a

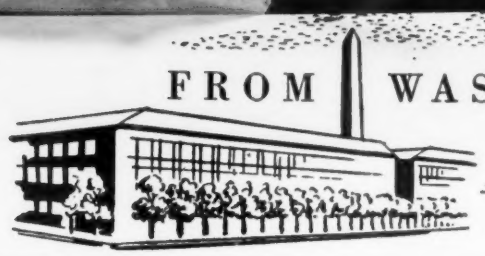
(*Continued on page 43*)

About the Author . . .

Mr. Wilson

Murray Alderson Wilson began his professional engineering career as city engineer of Hays, Kansas, in 1922. He moved on to the position of research engineer for the Bureau of Public Roads, and then to chief engineer for the Kansas Forestry, Fish and Game Commission. He began private practice as a consulting engineer in 1932.

A graduate of Baker University and Kansas State College, Mr. Wilson has written numerous articles on construction projects and professional ethics. He is a member of NSPE, the American Institute of Consulting Engineers, the American Public Works Association, and other professional groups. He is also a member of the Kansas State Board of Engineering Examiners, a member of the Board of Directors of the Kansas State College Research Foundation, and he is chairman of the Executive Committee of the Board of Kansas Wesleyan University.



FROM WASHINGTON

By
Milton F. Lunch,
N.S.P.E.'s Legislative Analyst

COMPREHENSIVE MANPOWER BILL SEEKS AID FOR TEACHERS; COLLEGES AND STUDENTS INCLUDED IN PROVISIONS

THE most far-reaching and comprehensive legislative proposal to institute some form of Federal program to meet the nation's needs for engineers and scientists has been offered by Representative Elmer J. Holland of Pittsburgh, Pennsylvania. Almost all of the bills on the subject introduced heretofore, running into the dozens, have dealt primarily with scholarships as a means of getting more students into the colleges and universities. The Holland bill also calls for a scholarship program, but in addition it contains the following unique features:

1. Supplement salary grants to raise the incomes of engineering teachers to the level paid engineers in industry with comparable qualifications.
2. Financial aid to engineering educational institutions by paying the full cost of educating the students holding the Federal scholarships, as distinguished from payment only of the normal tuition, fees and text book charges.
3. A two-pronged program under which engineering graduates would teach mathematics and science subjects in the high schools for three years, with supplemental salary grants to equalize their pay with that of the young engineers in industry. At the end of the three-year stint, the engineer-teacher would be eligible for a three-year graduate fellowship to study for a Ph.D. degree, also with an economic grant to keep the grantee's income up to that of engineers working in industry.

Representative Holland told the House at the time he introduced his bill: "We have had enough warnings. We have had enough speeches. But we have had little action. Today I propose action. I propose a concrete Government program that will lick the problem." He said that before preparing his bill he sought to get the best answers to the many questions involved and the best guidance in the kind of legislation which is needed by contacting the deans of all the nation's engineering schools. At the latest count, 126 deans of the 150 contacted had replied to the Congressman's questionnaire and offered suggestions. He told the House that the deans generally

Representative
Elmer J. Holland
of
Pennsylvania

agreed on two main reasons for the present engineering manpower situation: (1) precious manpower potential is being wasted by the failure of many bright high school students to continue to college; (2) the shortage of qualified teachers of engineering at the college level, and of qualified mathematics and science teachers at the high school level.

The scholarship portion of the Holland bill would provide thirty engineering scholarships each year to outstanding high school graduates from each of the 435 congressional districts, based on competitive examinations. In lieu of tuition, the school would receive "an amount equal to the actual cost to such school . . . without regard to the school's other income and resources . . . of educating such student and providing facilities (other than meals and lodging) in connection therewith." The student would receive $100 a month for living expenses while in attendance at the school. The proposal to pay the institution the full cost of educating the student instead of only tuition is based on the fact that tuition represents only a part of the university's costs per student. Statistics as of 1950 show that in tax-supported institutions tuition accounted for only 29.8 per cent of total institutional income,

and in private institutions it accounted for 67.8 per cent. Holland said that this provision would give the schools some financial help they need and should encourage the schools to enlarge their facilities.

The supplemental salary grants to university engineering teachers are stated in the bill to be for the purpose of encouraging them "to continue in the teaching profession, and to prevent such teachers from leaving the teaching profession to seek higher-paying positions elsewhere . . ." Holland said that the reports from the deans state that many of the best engineering teachers are being lured into industry every year through higher salary offers which the schools cannot match. The criteria for the amount of supplemental pay would be "such amounts as, when added to such teacher's regular salary as a member of the faculty of such school, will make his income substantially equal to the average income of industrial and other non-academic engineers of comparable qualifications . . ." Periodic checks would be conducted to determine changes in the amount of supplemental pay based on changes in non-academic compensation levels or changes in the regular salary or qualifications of the teacher. The supplemental pay grants would be paid to the university, to be turned over to the teachers without any reduction in regular salary because of the supplemental grants.

Under the high school teacher-fellowship arrangement for graduate engineers, Holland said the purpose is to hit at the two extremes of the manpower supply situation —both of which were said to be crucial by many of the deans—by providing qualified math and science teachers in the high schools to prepare students for engineering study, and, conversely, to provide the incentives to turn out more highly trained engineers and scientists in the graduate fields. An additional factor in the plan is the hope that many engineering graduates after having been exposed to an educational atmosphere for ten years (four to secure B.S. degree, three teaching in high schools and three in graduate work) would choose to stay in engineering teaching work, thus further alleviating the engineering teacher shortage. The economic side of the dual high school teacher-fellowship arrangement would work as follows: While teaching in the high school the engineer would receive, in addition to his regular high school salary, supplemental grants to bring his income substantially into line with the average income of industrial and other non-academic engineers of comparable qualifications. When the engineer completed his three-year high school teaching assignment and moved into his graduate study, the institution would be paid the full cost of providing the advanced education in lieu of tuition. At the same time, the engineer-student would be paid an amount per month (as living expenses) equal to the total amount per month which he had received while a high school teacher, including the regular teacher's salary and the supplementary salary grant.

The Pittsburgh legislator's bill provides a specific prohibition against any agency of the Federal Government exercising any direction, supervision or control over the curriculum or program of instruction of any educational institution or over its administration or personnel. The actual administration of the program would be in the hands of the National Science Foundation and the Foundation would handle the economic studies necessary to determine the amounts to be paid under the several supplemental salary grant provision, as well as the determination of the full cost of educating students at the institutions. The Foundation would be required to consult with the Engineers' Council for Professional Development in the administration of the program, and would file a report with Congress at the beginning of each regular session with respect to the administration of each program, including recommendations for revisions.

Both teachers and students are eligible for Federal economic aid under the Holland bill.

In offering his bill, Representative Holland said that the cost should be regarded as an essential expenditure for national defense. He estimated the cost of the undergraduate phase at $183 million for the fourth and succeeding years. The cost of the advanced fellowship program cannot be computed, he said, until it is known how many graduate students will enter the program, but he estimated that it should not cost much more than the undergraduate program. He told his colleagues that in a discussion of costs, "it is essential to recognize that money appropriated for this bill will go to develop our most precious resource, manpower. It will be money spent to meet an imperative need. Nothing is too costly if it is essential."

The Holland bill (H.R. 11200) has been referred to the Committee on Interstate and Foreign Commerce. As the boldest and most .all-embracing legislative proposal to cope with the engineering manpower situation it is certain to receive detailed attention and study by congressional groups and Federal agencies concerned with the engineering manpower subject, as well as from professional engineers and professional associations studying the many suggestions advanced in the critical manpower field.

Dean Compiles Land-Grant Survey

A survey of representative engineering schools in the Land-Grant colleges and universities indicates that shortages of teachers and facilities are a widespread major problem.

The survey, made of schools from coast to coast, was compiled by Dean John W. Whittemore of Virginia Polytechnic Institute, Blacksburg, chairman of the Engineering Division of the American Association of Land-Grant Colleges and State Universities.

The survey shows that, while most engineering schools are continuing to admit all qualified applicants, some are already turning away qualified students because they lack faculty members, and the necessary classroom and laboratory space for instruction, or dormitory space for housing.

Dean Whittemore pointed out that two very simple reasons could be given for the shortage of engineering instructors: one is that the high salaries offered by industry have made it impossible for colleges to compete, and the other is that the college-age population of the last few years has been low because of the low birth-rate of the 1930's.

Missouri SPE Has Meeting Slogan

"We Owe Our Profession More Than Our Profession Owes Us" was selected as the slogan for the 20th Annual Meeting of the Missouri SPE held in Kansas City, June 1-2.

Events at the affair included workshops for chapter presidents and secretaries, three panel discussions, and society committee meetings.

Among the speakers scheduled for the various sessions were H. Roe Bartle, Mayor of Kansas City; H. O. Croft, dean of the College of Engineering at the University of Missouri; and Curtis L. Wilson, dean of the Missouri School of Mines at Rolla.

JUNE MEETINGS of Note

American Institute of Electrical Engineers—Summer and Pacific General Meeting, June 25-29, Fairmont Hotel, San Francisco.

American Society of Heating and Air-Conditioning Engineers—Semi-Annual Meeting, June 18-20, Shoreham Hotel, Washington, D.C.

American Society for Testing Materials—Annual Meeting, June 17-22 Chalfonte-Haddon Hall, Atlantic City, N.J.

Material Handling Training Conference, June 17-30, Lake Placid, N.Y.

1956 Award Winner

Air Force Secretary Donald A. Quarles, above, prominent professional engineer, is the 1956 NSPE Award winner. Photograph is from a front cover of the *American Engineer*.

AF Secretary Quarles Honored by NSPE for Professional Services

Air Force Secretary Donald A. Quarles has been selected as the recipient of the NSPE Award for meritorious service to the engineering profession.

He was scheduled to receive an engraved plaque at the banquet session of the Annual Meeting in Atlantic City.

Engraved on the plaque are the words: "In recognition of The Honorable Donald A. Quarles, P.E., for his outstanding contributions as a professional engineer to the national defense, the advancement of public welfare through research and development, for industry and service to the highest principles of the engineering profession, this plaque is presented by the National Society of Professional Engineers."

Secretary Quarles planned to speak at the banquet session on "The Role of the Engineer in National Defense."

Born in Van Buren, Arkansas, Quarles studied at Yale and Columbia Universities. He served as a captain in World War I, and joined the engineering staff of Bell Telephone Laboratories in 1919. From 1948 to 1952 he was vice president of the Bell Laboratories, and in the latter year he also served as vice president of the Western Electric Company. From 1952 to 1953 he was president of the Sandia Corporation, Albuquerque, New Mexico.

His many professional activities have included the presidency of the American Institute of Electrical Engineers.

Appointed Assistant Secretary of Defense (for research and development) in 1953, Quarles received his appointment as Secretary of the Air Force in 1955.

Secretary Quarles was to be presented to the banquet audience by NSPE President Allison C. Neff, after an introduction by T. Carr Forrest, Jr., chairman of the Awards Committee.

Here's How It Can Be Done . . .

Getting Round Pegs Into Round Holes

Through Tests and Surveys, the American Society of Engineering Education Has Discovered How To Place Engineers Into the Jobs They Belong

". . . Job satisfaction is important, both to the individual and to the company which hires him. For upon it depends productivity, and in a time of shortage of technical skills, it is vital that this short commodity be used efficiently."

". . . Not all engineering jobs are alike in their demands of aptitude and personality characteristics, and not all engineers possess the qualifications to go into an engineering job at random and operate successfully and happily."

ARE you happy in your professional career? Does your work give you satisfaction? Do you find that you are called upon to do things that are somewhat distasteful? If you are temperamentally well-suited to your current position, how many years, how many jobs, how many companies has it taken you to reach such a fortunate position?

For the facts, as revealed by the preliminary results of a study being conducted by the Educational Testing Service, of Princeton, N. J., show that not all engineering jobs are alike in their demands of aptitude and personality characteristics, and that not all engineers possess the qualifications to go into an engineering job at random and operate successfully and happily.

Job satisfaction is important, both to the individual and to the company which hires him. For upon it depends productivity, and in a time of shortage of technical skills, it is vital that this short commodity be used efficiently. Yet men are assigned to a particular job by a method which is little better than random, and they find their way, partly by luck, partly by trial and error, into a satisfactory assignment only after long periods of frustration. And some of them are frustrated right out of the engineering profession.

In an effort to increase the efficiency of the placement process, the American Society of Engineering Education, through its Selection and Guidance Committee, suggested that a detailed study be made. Educational Testing Service, one of the nation's leading psychological testing organizations, was selected to conduct the study, with the cooperation of some of our largest employers of engineers. The initial participants were the American Telephone and Telegraph Company, Detroit Edison, B. F. Goodrich, IBM, Westinghouse Electric, while Sandia Corporation has been added more recently, with other possible participants being considered.

The first step was obvious. It was to take a look at the professional engineer, to see what kind of a man he was, what kinds of jobs he filled, what were the requirements of his work. The ETS researchers, under the direction of Dr. David R. Saunders, began to collect information about all the engineers employed by the five participating companies.

Titles seemed to mean very little. Engineers worked under all sorts of titles, but there didn't seem to be too much relationship between the title and the actual work done, as determined by the formal job descriptions. And the investigators weren't too sure how accurately the job

descriptions actually described the work. So while they started with these papers, they didn't stop there. They made a list of all the things they thought of that engineers did with their time. This was based both on the job descriptions and on discussions with experienced engineers. This worked up into a long list of assorted tasks, but they finally managed, by eliminating trivial items, and those which seemed to say the same thing using different words, to reduce this to thirty items, which later on was reduced to twenty-four during field-testing.

THIS list of twenty-four items was the basis of a job analysis form which went out to the field. Supervisors in the cooperating companies were asked to take a look at each of the engineering jobs with which they were familiar, and use the list of tasks to analyze it. This was done in two steps. The first was to indicate about how much time an engineer spent performing each item. The supervisors were then asked to indicate, by ranking the items in numerical order, how crucial it was for the engineer in question to perform each item adequately. They were reminded that the most crucial item was not necessarily that which occupied the greatest portion of a man's time. In addition, the difficulty of getting a man who could perform adequately in one of these items should not be a factor in determining its crucialness.

These forms were filled out for twenty-four different jobs, all employing engineers, in the five companies, and were sent to ETS for collating. It became apparent, through factor analysis, that the activities clustered in five main groups, and the kind of job an engineer has could be defined in terms of combinations of these clusters. When this analysis was made, all of these engineering jobs could satisfactorily be placed in one of seven types, according to the following table:

Type I: Research: Develops and tests hypotheses or generalizations; originates and evaluates ideas; makes decisions from data

II: Application: Evaluates performance of materials, designs, methods, processes, products, equipment, etc.; keeps informed of new ones

III: Design: Makes preliminary sketches, detailed drawings, and complex calculations; plans best use of materials

IV: Product: Writes manuals, specifications, proposals; keeps records, does some trouble-shooting

V: Operations: Does staff work involving versatile application of engineering principles in a variety of activities

VI: Supervision: Controls expenses; plans use of personnel; develops people towards promotion

VII: Sales: Conducts negotiations; sells ideas to people

IT is now possible, through use of this list of activities, now called the Key Group Data Form, to assign any engineering position to one of the types I to VII. This can be done objectively, since individual judgment, when the list of activities is followed, does not affect the assignment of the position.

While it would be perfectly feasible to continue the study with the use of the noncommittal and nondescriptive Roman numerals, psychologists, like everybody else, find

". . . The research engineer is high in quantitative and inductive reasoning, is interested in ideas and theory, is tolerant of complexity and uncertainty. He is self critical and combines a creative spark with common sense."

it a little easier to use and remember things when there are names for them. So the ETS staff have applied a name to each of the seven types, and here they are:

Cluster of Activities

	A	B	C	D	E
Type I:	X				
II:	X	X			
III:				X	
IV:	X		X		
V:		X	X	X	X
VI:					X
VII:		X			X

The clusters have been given the following descriptions:

A: Employs basic scientific skills

B: Applies developed technical information to current problems

C: Provides various supportive technical services to ongoing activities

D: Prepares detailed plans for future use

E: Employs human-relations, accounting and perhaps other non-technical skills

But this was only part of the research program. Everybody knows there are different kinds of engineering jobs, but are there different kinds of engineers? To some of the old timers, this was almost heresy! An engineer is a trained technician, they said. Place him in any job and

". . . The supervisory engineer is very much interested in people. He is creative in dealing with them, and pays a great deal of attention to the future in making decisions. The sales engineer is high in talkativeness and impulsiveness. While he is not too concerned with theory, he has a great interest in economic matters and status aspiration."

he has the stuff to handle it. Stuff and nonsense, some others replied. Jobs are different, job requirements are different, people are different, and these differences are important. This kind of argument could go on for years without reaching any conclusion. It could be answered only with the facts, and getting the facts constituted the next phase of the study.

A long list of various characteristics which might affect engineering performance was drawn up, and tests selected to measure these traits. Some were aptitude tests, others achievement tests, and still others were in the field of personality. All in all, 56 characteristics were measured by the full battery. This was a much larger battery, of course, than would eventually be used, but it is almost impossible to predict which qualities will turn out to be the best predictors. Therefore, many are used in the initial testing, and are eliminated only as they prove, through study of the records, to be limited in value.

These tests, taking several hours to administer, were given to nearly 2000 engineers. Each of them had been assigned to one of the seven types, according to the classification of the job he was currently holding down. The testing was limited to experienced engineers, with four to seven years at work. This was done to make it somewhat more likely that the men had found their way into the field which met their needs, that they had achieved job satisfaction and that they had passed through the settling-down phase of their career.

As had been guessed in advance, it turned out that there were substantial differences among the various types. The sales engineer was a different sort of person from the research engineer. The application engineer differed from the supervisory engineer. Of the original fifty-six characteristics, about thirty proved to have value in discriminating among the groups, while seven in particular turned out so well that a study of the scores made by an experienced engineer will allow you to tell, on the basis of his scores alone, what kind of a job he is holding.

The differences from one type of job to another are rather interesting. While for scientific accuracy, they should be presented as specific scores on specific tests, and the final report will be expressed in these terms, verbal descriptions have been developed, and they are indicative of the general characteristics of six of the seven types.

The *research* engineer is high in quantitative and inductive reasoning, is interested in ideas and theory, and is tolerant of complexity and uncertainty. He is self-critical and combines a creative spark with common sense. The *application* engineer is much like the research man, but not as extreme. He shows a greater interest in things and less interest in theory. The *product* engineer is, perhaps, the "typical" engineer as the public pictures him. He is a practical man, interested first in things and then in people. The *operations* engineer is high pretty much across the board, except for one or two qualities that are unique to the research man. He is interested in people, things and economic matters, and tends to look ahead. The *supervisory* engineer is very much interested in people. He is creative in dealing with them, and pays a great deal of attention to the future in making decisions. The *sales* engineer is high in talkativeness and impulsiveness. While he is not too concerned with theory, he has a great interest in economic matters and status aspiration. No description of the *design* engineer is presently available in these terms, primarily because there were too few men in this category who went through the battery of tests.

As a result of giving the massive group of tests to these men, it has turned out that a handful of tests can give enough information to help identify the kind of man who finds any one of the seven types a satisfactory and rewarding occupation.

Now comes the big question—can these tests be useful in directing young engineers into the right kinds of jobs? We already use some judgment in placing people. Personnel practices are not entirely arbitrary. A good personnel man, if he has enough facts on a man's background, and enough time for a thorough interview, can estimate a man's character quite well. But can the results of tests help him make a better decision? Again, carefully controlled research is needed to determine the answer. Many young engineers, just entering the employment of the participating companies, are being given the new battery, but the results are not revealed, either to themselves or to the companies. But in about two years, they will be pulled out, and checked against the progress of the group. Where are they? What jobs are they holding? How well have they done? Would following the test results have improved their positions? Time will tell.

In the meantime, you can use these preliminary results to guide you, both in your career and in helping to place younger men. Look at the job you are trying to fill and then look at your characteristics. The better you can match the characteristics of the man against the characteristics of the job, the greater efficiency and satisfaction you will get.

Eventually, the battery may be given to engineering students early enough in their senior year, so that its results will be of help in guiding them into the right careers. If successfully developed, it may help to eliminate floundering around before settling down. It may offer one partial answer to the problem of the critical engineering manpower situation.—***End.***

Shaping Our Professional Status

By Morris D. Hooven, P.E.,

President, American Institute of Electrical Engineers and, Member, NSPE

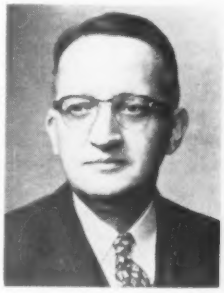
How do we shape our professional status? Or, perhaps more correctly put, how has our professional status been shaped? Since engineering is among the oldest of the professions to have been practiced, and among the youngest to have been organized, history, rather than any effort from engineers themselves, has probably determined the shape of the profession as it now exists.

There are many areas, however, in which engineers acting in concert today can help to give shape to the profession of the future. The most obvious and perhaps the most fruitful field for determining the future lies immediately at hand. Its locale is the secondary school system. It is here that the transition from being just one of the boys to being a prospective engineering student occurs. It is here that the call to serve a great profession must be clearly sounded and perceptively received.

Engineers are not doing too well with the younger generation. Every child must at this period in history grow up to be a member of a technological civilization. Every bright child, particularly if he has within him a reasonable amount of reliability and stability, must expect the possibility of being tapped for science or engineering. And at present there has been introduced into the educational system odd deviations from the "three R's" which seem at least to have had the result of making fewer people desirous of serving technology than previously. There is in the later grades an increasing dearth of science and mathematic teachers. In high schools this is being keenly felt. Many engineering colleges report that they must give a year of additional work in order to bring a possible engineering freshman up to college entrance level in science and mathematics. Whereas most of the preceding generation took physics when in high school, now less than five per cent of high school students are enrolled in a course such as this which is fundamental to the understanding of the present technological civilization. One half of the upper quarter of high school graduates do not go on to college.

No matter how the question of quantity of students required for engineering education is argued, there can be no dispute over the quality required. Only the very best can make the grade. An analysis of Army General Classification Test scores shows that the brightest students are now enrolled in physical sciences, chemistry, and engineering. Law keeps crowding ahead. Medicine and the ministry will never be content to take second choice. Since engineering and the physical sciences already number as many graduates as do law, medicine, and the ministry combined, and since the demand for engineers seems to be increasing steadily, it does not take any great gift of prophecy to foretell increasing competition among the professions for the cream of the class.

Here is where NSPE finds itself in a position of great responsibility. Geographically organized, it is in an excellent position to help local school authorities maintain high standards of learning in the secondary schools. Close attention to the need of science teachers for summer jobs in industrial technology is an obvious duty. Insistence on the availability of science and mathematics courses is a necessity. And finally, who is better qualified to give vocational guidance to a neighborhood boy than the engineer who is himself a neighbor? He, should he find a prospect who is good in math only, or one whose manual cleverness is exceeded by lack of ability in reasoning, can best guide these prospects into other fields. Or, should he find a boy obviously earmarked for engineering, the neighbor-engineer becomes immediately the proper guide and mentor for the candidate.



Morris D. Hooven, right, of the Public Service Electric and Gas Co., Newark, N. J., is president of the American Institute of Electrical Engineers. Mr. Hooven has served as a vice president and director of the Institute, in which he has been active for many years. He has been with Public Service since his graduation, *magna cum laude*, from Bucknell University.

THE Engineers' Council for Professional Development leans heavily on NSPE in its high school guidance work. Initiated many years ago, high school guidance by engineers reached only scattered areas throughout the United States and Canada even though the effort was continent-wide in scope. There was little coordination between areas. Some six or seven years ago intense efforts were made to attain complete coverage and state committees were set up, arranged in regional groupings. It was natural that the state professional societies predominated in the formation of these state committees since many of them were already doing excellent counseling work. As of now, there are at least eight states in which the professional society committee is the state committee. In many others, the professional societies are cooperating with local sections of the technical societies in establishing town or city committees for student guidance. It is a rewarding work.

Every high school in the nation should have a group of engineers available to it for advice and consultation with the school authorities or guidance for the students. Herein lies a community duty which must not be avoided. Each state society, each county chapter has a pleasant chore ahead.—***End.***

Proposal to Aid Math, Science Teaching Made in Testimony

A proposal for Government fellowships for engineering and science graduates has been made to a Congressional Subcommittee by Cherry L. Emerson, former vice president of Georgia Tech, on behalf of the NSPE.

The proposal was outlined in testimony before the Subcommittee on Research and Development of the Joint Committee on Atomic Energy.

Mr. Emerson suggested that the Federal Government could provide fellowships for graduates who have attained a BS in engineering, physics, chemistry, or mathematics. These graduates would obligate themselves for a period of three years to teach general science and math courses in high schools.

Their salaries would be supplemented by the Government beyond the amount normally paid high school teachers. At the end of three years they would be eligible to a fellowship which would enable them to attend the institution of their choice for three years and obtain a Ph. D. in their field of specialization.

Mr. Emerson, a former vice president of the NSPE, suggested that the program be administered by the National Science Foundation.

In further testimony Mr. Emerson urged that Congress give attention to the critical engineering and scientific manpower situation by:

—Legislative action to restore to professional engineers and scientists in the Federal service the professional classification which was lost when they were placed in the General Schedule in 1949.

—A compilation, possibly by the National Science Foundation, of the engineering and scientific scholarships available.

—Amendments to the tax law to permit credits against individual and corporate income tax for amounts paid as tuition or fees to institutions of higher learning.

The complete testimony follows:

Mr. Chairman, Members of the Subcommittee:

I am Cherry L. Emerson of Atlanta, Georgia; and I appear before you to present the comments of the National Society of Professional Engineers on the subject of your current hearings. We appreciate very much the invitation of Chairman Price to participate in these important deliberations, and I would like to express the regret of our Society's president, Mr. Allison C. Neff of Middletown, Ohio, that a conflicting engagement made it impossible for him to accept the invitation personally.

Mr. Emerson before Congressional group.

Acting in Mr. Neff's stead, I would state for the record that my background related to the subject of the hearings includes degrees in mechanical and electrical engineering and registration as a professional engineer. I was employed as a professional engineer for five years with one of the largest electrical manufacturing corporations and as an engineering executive for five years with one of the southern power companies. For twenty-six years, I was associated with Robert and Company of Atlanta, a well-known firm of consulting engineers, with the position of chief engineer, vice president and president. I left this firm in 1945 to become dean of engineering, Georgia Institute of Technology. In 1948, I assumed the position of vice president of Georgia Tech and served in that capacity until my retirement July 1, 1955. At that time I became associated with an Atlanta architectural firm in an engineering consulting capacity. During my continuing membership in the National Society of Professional Engineers, I have served as a vice president and as a member of the National Affairs Committee, among others.

The National Society of Professional Engineers has a membership of 37,000, all of whom are registered under the engineering registration laws which are in force in all of the states and other jurisdictions of the United States. The individual memberships are through forty-one affiliated state societies, and through the 350 local community chapters of the state societies.

We have long been concerned, as have other organizations, with the growing problems associated with the development of adequate numbers and high quality of the nation's engineering personnel to serve what at times seems to be an insatiable demand by industry, governmental organizations at all levels, including the needs for the foreign technical assistance program, and, particularly, those organizations responsible for research, development and production for national defense. In addition, this Subcommittee is rightly concerned with the technical manpower needs which are certainly developing rapidly in the new field of atomic power.

This Subcommittee is to be commended for giving its time to this problem, and for focusing national attention on a matter which has implications far beyond the interests of the engineering and scientific professions—implications which involve every citizen in terms of national survival if war should be thrust upon us. More hopefully, the questions before you involve the development and maintenance of the very best in defensive strength so that such strength may prevent world disaster.

The statistics about the problem are

(*Continued on page* 41)

An *American Engineer* SPECIAL REPORT

Re: Soviet Education in Aeronautics—A Case Study

● Secrecy still shrouds much of the engineering and scientific activity in the Soviet Union. But the general picture is getting clearer, thanks to a number of major research studies conducted by groups of specialists at such institutions as the Russian Research Center, Harvard University, and the Center for International Studies at M.I.T. A recent report issued by the M.I.T. group has concentrated on technical education for aeronautics.

The 112-page report, prepared under the direction of Dr. Leon Trilling, assistant professor of aeronautical engineering at M.I.T., concludes that the Soviet educational system has trained a small but elite corps of aeronautical scientists who are second to none. These top people, acting as small flexible task forces, have solved a number of theoretical questions selected to keep Soviet aeronautical science abreast of any competitor. But the report emphasizes that the Russian technial leaders are perched on a shaky engineering base. The full cross section of engineers in the Soviet Union apparently have not yet acquired that degree of engineering "feeling" which only broad familiarity with machinery can bring. They work by the book and require detailed direction. For this reason, excellent designs must frequently be adapted to inferior execution, and tooling or high-grade workmanship is reserved for only key parts of the assembly.

RUSSIAN SCHOLASTIC PROGRAM

Future aeronautical engineers in Russia get off to a sound start in the basic educational subjects—including two years of that Soviet prerequisite, Marxism-Leninism.

Table shows scholastic program for two semesters at the Ordzhonikidze Aeronautical Institute of Moscow.

First Year, 1st Semester

	Lecture Hrs.	Lab & Seminar	Home Study	Total
Marxism-Leninism	3	1	3	7
Foreign Language	0	2	2	4
Mathematics	5	3	5	13
Chemistry	2	2	2	6
Descriptive Geometry	3	2	0	5
Drafting	0	5	0	5
Introduction to Aeronautics	3	0	3	6
Elementary Laboratory & Shop Work	0	4	2	6
Physical Education	0	2	0	2
Total Hrs.	16	21	17	54

Second Year, 1st Semester

Marxism-Leninism	3	1	3	7
Foreign Language	0	2	2	4
Mathematics	3	3	3	9
Physics	3	2	3	8
Drafting	0	4	0	4
Elementary Aerodynamics	3	3	3	9
Strength of Materials	3	3	3	9
Physical Education	0	2	0	2
Total Hrs.	15	20	17	52

The M.I.T. report also gives special emphasis to the Soviet doctrine that education trains skilled technical personnel for the service of the state. The constant subordination of the individual to the national plan is an important psychological influence on professional people in the Soviet Union. Aeronautical engineering receives special attention and quite possibly illustrates their best efforts. Nonetheless, many of the strengths and weaknesses of Soviet aeronautical education are probably representative of other areas. There exists in the Soviet Union a group of talented people with drive and ambition who are generally permitted to reach the top, sometimes quite rapidly, and their number has increased as a direct result of educational policy. But there are still only a few men who carry the Soviet engineering apparatus on their shoulders, being simultaneously teachers, scientists, and designers. There can be little doubt that the ability and knowledge of this key nucleus is on a par with that of the best men in similar positions anywhere, but at the present time these men do not have adequate support, that is, the technical support of a well-balanced body of engineers and technicians.

(Please turn the page)

The pattern of vertical integration is typical of technical training in Russia. This means that, in general, the segments of Soviet professional programs are defined by the industrial monopolies. This is just the opposite of the familiar horizontal pattern of subject matter divisions found in the U. S. Here, a man trained as an electrical engineer has a wide range of employment opportunities. In the Soviet Union, responsibility for the productive activity of the nation is divided among a small number of powerful ministries, each of which has full charge of a definite segment of the industrial economy. One of the chief weaknesses of the Soviet system is its inevitable duplication. A mechanical engineer of the Ministry of Aircraft Production, for example, may be trained to design the same valves and piping as one in the Oil Production Ministry without any interchange of information between the two. Yet the system also permits a flexible use of top technical people within any given ministry.

Key men carry a variety of responsibilities. They lecture at the university, supervise research at the aeronautical institute, and serve as consultants to the industry itself. This system permits concentrated and integrated attack on any given problem. Recent reports have indicated that the Soviet aircraft industry has produced turbojet engines appreciably more powerful than those in mass production in the U. S. at the present time. While know-how and ideas from German and other sources have helped in this accomplishment, they would not have been absorbed and put to effective use so rapidly if native groups had not mastered the fundamentals of the problem independently.

A GERMAN VIEW

Here is a summary of the impressions brought back by a number of German engineers recently returned from the Soviet Union, where they had worked in close contact with Russian engineers:

So far as the technical part of his training is concerned, the Soviet engineer covers as much ground as the average Western engineer even though his outlook is narrower and his range of interests and skills somewhat smaller. He often displays a preference for theoretical solutions even when they are clearly less effective than a simple test, either because it is easier to apply a set of formulas from the book, or as a strange, persistent remnant of the unproletarian prejudice that brainwork or paperwork is more refined than laboratory work. But the real weakness of many Soviet engineers is that they have never been seriously trained to make decisions or to take responsibilities. In their schooling they learned what the book said, and even performed experiments according to strict instructions; but they seldom had enough personal contact with their professors to argue with them, and certainly the psychological climate did little to encourage initiative. They are ill-prepared to experiment with possible new solutions to a given problem. Especially if trying something new involves the expenditure of state funds, Soviet engineers are afraid of being blamed in case of failure. They also seem to have difficulty in starting a problem—although once under way they use their extensive knowledge effectively and bring their task to a generally successful conclusion. It follows, of course, that they are excellent adapters and improvers of foreign ideas and equipment even when they fail to give credit where credit is due. The lack of initiative, the lack of faith in experiment, and a certain reverence for academic title are illustrated by the following incident reported by a returning German who was at the time engaged in helping design an electronic control circuit at a research institute. The Soviet leader of the group responsible for that design came to him to ask what power input would be required to obtain a certain signal from a new tube. The German said: "I do not know." "But you are a German professor. Can't you calculate it?" "No; let us try several values of input power and find out." To which the Soviet engineer said: "Oh! you German scientists! You know the answer, but you won't tell us."

In spite of the Soviet strength in science and applied science, their situation appears less favorable in engineering. In the sciences there existed a solid pre-Revolution base which required only to be broadened. In engineering, the Soviet system started almost from scratch. Much remains to be done to create a technical base in engineering instinct comparable to the American or German base.

The number of graduate students at Soviet technical schools is also uniformly low, ranging from two per cent of the student body at the Bauman Technical School in Moscow down to zero at many of the outlying institutions. This contrasts to 38 per cent at M.I.T., and an average of 12 per cent in American technical schools generally. The Soviet situation may be the result of a deliberate policy which aims to get engineers into the industrial stream as quickly as possible and to enable the senior professors to educate the best graduates as carefully and thoroughly as possible. Although a long-range Soviet policy of industrial expansion in the future and the training of additional teachers should provide an increasing supply of engineeers, it is doubtful whether they will generate sufficient self-reliance in technical matters without extensive changes in the entire Soviet approach to the problem of education.

N.S.P.E. Believes

PROFESSIONAL POLICIES

BY PAUL H. ROBBINS, P.E.

Executive Director

N.S.P.E.

PERHAPS the most frequent inquiries coming to the officers of the National Society, the affiliated state societies, and the local chapters—from members and non-members alike—are requests for NSPE's position on various professional matters. Over the period of its existence, NSPE has considered a great many professional questions. The position of the Society has sometimes emerged as a result of extensive study on the part of its committees. Other policies have been determined as a result of carefully worded resolutions emanating from state societies and chapters. Still other policies have been evolved as the result of legislation or Governmental decision. No policy of the Society has been adopted, however, until it has been carefully considered by the representatives of the state societies sitting as the Board of Directors of the NSPE. The accumulation of these policies represents an answer for those members of the profession who ask the question, "For what does NSPE stand?"

NSPE believes it is important that the members of the Society, as well as those others interested in the Society's activities, have a clear-cut answer to this question. To accomplish this, the Board of Directors assigned to the National Affairs Committee the responsibility of reviewing the extensive considerations of the NSPE over the years and compiling the more important professional policies which have been adopted. The National Affairs Committee completed this monumental task and presented to the Board at its Spring Meeting a compilation of policies, carefully indexed for handy reference. This compilation was approved by the Board and has now been put in print in the form of a booklet on "Professional Policies."

The index is illustrative of the wide scope of NSPE's interest. The some forty-six different policy statements contained in the 36-page booklet include NSPE's position on such things as advance planning of public works, contracts for engineering services, employment practices, labor relations, the engineering profession and national security, registration, unity, and water pollution. The booklet has been prepared for ready reference with a table of contents listing the subjects covered by the policies, and the policies themselves are headed by appropriate marginal titles arranged alphabetically.

The following quote from the introduction is illustrative of NSPE's contemplated use of this publication: "The full purpose of this publication will be served if it is used not only as a source of current information, but, in addition, as a means of informing the members of the engineering profession and the lay public of those professional policies which are intended, in all cases, to advance the interests of the national welfare and the engineering profession." In approving the publication of these policies, the Board recommended that each policy be reviewed at least once every three years for the purpose of reaffirmation, revision, amendment, or recision. It is planned that a new edition of the compilation will be published each year so as to include such changes and new policies as may have been adopted.

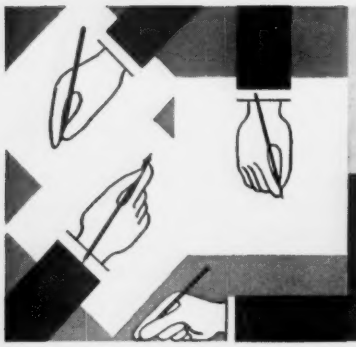
A copy of the policy booklet has been distributed to each chapter president and secretary, and to the officers of the state societies. It is sincerely hoped that this booklet will serve a number of useful purposes for the Society. Its obvious use as a reference document as to the Society's position on a number of topics is one which will make it valuable for leaders at all levels.

NSPE believes it will serve any member, both as to whether the Society has established a policy with respect to a particular item, or to the stand taken by the Society on such items as are listed. It will also serve as a valuable document for membership purposes, for despite the extensive amount of publicity and information concerning the Society, there are many in the engineering profession who are uncertain as to the objectives and position of the Society on many questions. Potential members interested in the general philosophy of professionalism sponsored by the Society will find in this booklet a ready reference and answer to their questions.

Frequently, of course, committees of the Society find that items of professional concern are presented to them for study and recommendation. Questions frequently arise in such instances as to whether or not a National policy has been established on this subject. By reference to the policy booklet, it will be possible, not only to determine the National policy, but in many cases to outline the reasons behind the Society's decisions.

Members wishing to have a copy may secure one by dropping a card to the NSPE Headquarters in Washington.

What NSPE believes on many professional matters is contained in this one publication.—***End.***



Professional POSTSCRIPTS

Once again the Oklahoma Institute of Technology at Oklahoma A. & M. has announced the winners of the annual Dresser Essay Awards Contest. The first prize of $75 was awarded to Richard A. Rucker of Stillwater; the second prize of $50 went to Rex Martin Ball of Oklahoma City; and the third prize of $25 to Mike H. Trower of Tulsa.

Now, through the courtesy of Edward R. Stapley, P.E., Dean Emeritus of O. I. T., and chairman of the O. I. T. Committee on Fellowships, Scholarships, Prizes and Awards, we are pleased to present this year's winners below. Prizes for this contest to encourage writing by engineering students were set up from a portion of a fund to the O. I. T. by Engineer L. L. Dresser, president of the Dresser Engineering Company, Tulsa. Engineer Dresser is a past-president of both the NSPE and the Oklahoma SPE.

We present Mr. Rucker first and then follow with Messrs. Ball and Trower . . .

—PP—

In a world of atomic power, electronic brains, and conquest of outer space, man enjoys a standard of living heretofore unparalleled in his history. The immensity of scientific achievement is at once astounding and dynamic proof of the sovereign genius of man when applied to the conquest of nature's physical laws. He has surveyed the infinitesimal world of the electron microscope, unleashed at his command the very energy of the sun, and now is seriously considering the exploration of his last frontier, the infinity of outer space. Yet the inability of man to understand and get along with his fellow man, a scourge which has plagued him since the Stone Age, continues undiminished. Here lies his greatest expanse of ignorance: his relationship with himself. This ignorance is not just a nebulous concept applied to the high level of intercontinental animosity and the resultant international conflicts, but is a very real, ever present failing of individuals in their relation to each other in every day life.

In order to establish a basis for this discussion and to insure mutual understanding of what is meant by this failing of mankind, I extend a definition which reasons that the ignorance of man in relationship to man is essentially a lack of intimate, intelligent communication among all the members of a society, a lack created by the elevation of selfish, individual interests above man's ideal desire for appreciative understanding of his fellows, resulting in a partial fragmentation of that society into little self - interested, pseudo - sufficient worlds. From this lack springs the consequent characteristics of human self-interest: hate, greed, envy, intolerance, and social indifference which display themselves to a greater or lesser degree in all levels of society.

I will interject here that I am not attempting to create the impression that man is basically evil; but that human failings, however minute, do exist and affect our understanding of each other in proportion to the magnitude of their existence.

To advance the significance of this discussion still further, I put forth the observation that, in the supreme struggle for superiority among the nations of the world in the advancement of scientific intelligence and technical achievement, the demands placed on the creative minds involved in that advancement for each nation cry for the complete devotion of ambitions, interests, and even lives. This absorption tends to withdraw the scientist or engineer from the dynamic social world about him and reduces his intimate association and communication with that society, thus aggravating the personal characteristics of social indifference and intolerance of the diverse personalities about him.

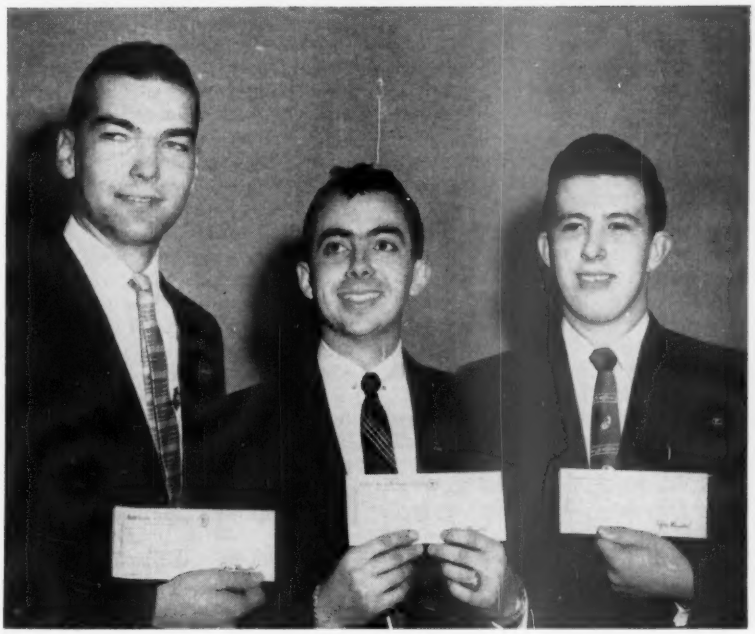
The clamor for superiority in the race for an un-interceptible intercontinental missile drowns out the feeble cry for understanding among men. Men beat their swords into plowshares as prophesied, but in a score of years turn around and pound them back again into a still more terrifying weapon, as greedy, politically corrupt and power-hungry governments again threaten the world with dictatorial domination.* As this international contest grows in proportion and complexity, so grows the ever present call for the scientific specialist who, because of his devotion to a narrow band of interest in the scientific spectrum, has delved into the outer reaches of that band, and is, therefore, the only one capable of grasping the desired concepts and interpreting them for the appreciation and use of the entire scientific fraternity. Our educational system is slowly adjusting to these demands of industry for more specialization, as well as to a much needed turn to a broader exploration by the student of the more basic sciences. It is the specialization, however, with which I am primarily concerned at the moment.

A common reference is made to the "absent-minded professor" or the student "bookworm" who supposedly gets so wrapped up in his own steeped world that the living society about him fades into his subconscious as the whole of his interest is focused on his all-important goal. I hold that these categorical individuals are not fictional nor are they non-existent in our present society. Conversely, I do not believe that because an individual pursues a science that he, choiceless, falls into introversion. I do believe, however, that in any field of concentrated endeavor, be it engineering or oil painting, there is a definite tendency for the unwary individual to sacrifice broadness in point of view to the isolationism of his all-consuming interest. The inevitable result is a decay of his ability to communicate with and understand people, their varied interests and motivations. This is the destructive withdrawal of the creative mind which destroys the humanity of men. This withdrawal is what intelligent, thinking, observant engineers and scientists will recognize and gird themselves against as they proceed to become a part of the "Age of the Specialist." It should be noted that I have not proposed the false notion that specialization itself is evil or destructive, but that when specialization becomes the whole of a person

* I feel that I should at this point make clear that I take no quarrel with this nation's defense policies, but I am trying to develop the growth of an important result of the present international attitude.

and not his profession, this is both evil and destructive for it divorces him from association with his fellow men, kills his interest in them, and eventually their interest in him. The engineer, the scientist, or any aspirant to a demanding profession must realize that his acceptance of high endeavor brings on the added responsibility for a conscious effort on his part to remain in intimate contact with his fellow man, his interests and desires. The ultimate requirement is that all members of a society, from scientist to storekeeper, cooperate to perpetuate the well being and advancement of that society. The degree to which this requirement is satisfied is dependent to a great extent upon the ability of the scientist or the engineer to be aware of and interpret the needs and desires of the society and to use his scientific knowledge and technical skill for the satisfaction of these wants. The continued existence of this ability necessitates that he remain in the world community as a dynamic element maintaining intimate contact with it, not set apart from it as an impersonal brain in a secluded laboratory.

To make a timely and worthwhile contribution of oneself to this society requires that the individual has a knowledge of it: its religions and arts, its ills and potentials—things which electronic instruments do not measure or mathematical equations express. This I firmly believe.



Here are the O. I. T. essay contest award winners. From l. to r. are Richard A. Rucker, first place award winner; Rex Martin Ball, second place; and Mike H. Trower, third place.

. . . Mr. Ball

From the beginning of recorded history, man has tried and failed, tried again and progressed, and tried once more and succeeded in a steady progressive climb upward. Since the Renaissance—which blossomed forth with man's greatest cultural improvements since the dreary Dark Ages—there has never been a more dynamic era than the fabulous Twentieth Century. Science and technology have advanced far beyond the greatest expectations of even the most forward thinking philosophers. And now in the wake of this bright atom dawn there looms a more magnificent horizon of the fantastic future.

When one considers the astounding progress of today and envisions the limitless realms that will be conquered tomorrow, it is startling to realize that it has been less than two hundred years since the introduction of machinery which revolutionized every phase of Western culture.

Massive factories grew where wildlife once flourished undisturbed beside the quiet streams, and with these industries came development of new urban communities. The resultant change was evident in more than the topography of every land, for people now began to think and act differently than they had in the handicapping ages of the past. Strangely, though, there was little or no change in architecture.

Typical of Renaissance times was the custom of one architect employed by one owner to perform one single duty, such as Michelangelo's appointment by Pope Leo to supervise St. Peter's in Rome. Even as late as 1906, when Pennsylvania Station was erected, the project was planned by Charles McKin under the commission of Alexander Cassatt.

As the industrial revolution has given way to the Atomic Age in the past few years, the chains of conformity have been broken, and a new architect has been created. This new architect is not sufficient within himself. He is a part of a profession which not only works with concrete, glass, machinery, and steel, but also satisfies, or endeavors to sate the desires and ideals of society. The team of architects and other engineering specialists combine their talents, energies, and skills to meet the needs of mankind.

To this combination of materials, machines, and men and the advancement of the principles and ideals embodied within the profession shall I devote my life. In becoming an architect, I will fulfill far more than just a life-long professional ambition. I will meet my obligations to society and my fellow men in applying toward the progress of mankind all that I possess in creative ability and talent as well as acquired scientific methods and techniques.

A successful architect must go beyond dream sketches of ideal construction. He must skillfully take the client's needs—both physical and spiritual — adjust these needs to the environment of the project, and then adapt these ideas on a dollar and cents basis. Few architects have the ability to accomplish this "dollar and cents" architecture alone. Advance of modern technology has been so rapid that it is virtually impossible for one to grasp all the details of construction. New fabrication methods, new structural materials, and new machines have produced fields of so broad a scope that it has become financially attractive—as well as practical—for engineers to specialize. These other engineers have become the architect's closest associates in steady cooperation and mutual progress. However, the exacting job of combining these various fields of specialization into a smooth working unit still belongs to the architect. Nevertheless, this is only a small part of the architect's obligation to his client, and if he ceases to advance his project past

this mechanical stage he fails in his duty to the profession.

In compliance with the demands of a fast-moving world, the architect, along with many other business and professional men, has lost sight of his ultimate goals in the narrow, limited confines of a day-by-day existence. Consequently, many of today's architectural triumphs will soon, in a calmer and more sane tomorrow, be seen for just what they are—failures. Modern architecture, as such, makes provision for the latest mechanical devices, to be sure. Still it has forgotten that it is created for men, not for machines. Practicality and efficiency thus have culminated in achieving a sterile, mechanical architecture which lacks warmth or even life. Buildings of lasting beauty have grace and dignity. They may not breathe, but there is at least the atmosphere or feeling of life within them. The typical modern box-like building will remain cold and dead as the Cathedral of Notre Dame in contrast rises in even greater majesty and splendor. This is not meant to imply that to progress now in architecture one must retrogress to the patterns of yesteryear. This is but a pleading for concentration on individual needs. All style and distinction must not be sacrificed for the sake of unity. And there is hope, for the true magnificence of the human race lies in the truth that it is flexible and always capable of change—never static, ever growing and developing in scope and depth. Thus the most important task for the architect is to unite human feeling with modern technology, resolving the two into one force which will produce the most usable forms in pleasant surroundings.

The architect of the present and the coming day must replace mechanical monotony with buildings which stand as a statement of each man's individuality. A building must be designed to its function, and that function is to serve men. Certainly there is not one solution to all building types since the activities of the men who will work or dwell within are never identical. A house should not resemble a factory any more than a church should look like an office building. Surely, the architect must reconcile science with function.

It is here in the United States of America that freedom has stimulated the greatest growth of the human race. It is this very principle—freedom—that has given rise to the importance of individual rights and privileges. This, then, should be the guiding factor in every building.

Much of America remains undeveloped. The country is still so new that men must create rather than copy. Architecture can thus develop freely without the handicap of "hand-me-down" ideas or traditions. In this broad expanse of space, there is the atmosphere of freedom, a healthy environment in which to culture growth of any idea without distortion of contrasts. The architect must proclaim this freedom, and he must use it wisely.

Architecture for the most part reflects our civilization as it shows the articles and tastes for which men are willing to pay a price. This forces the architect to become a combination of educator and salesman. The product he displays is honest design based upon function, materials, and men. In today's economy-architecture, there is oftentimes the tendency to secure only the greatest amount of area for the least possible expenditure. This the architect must do, but a more important function is that he must also educate his client to the fact that men must live and work in more than a cubical container in order to happily and efficiently produce anything of worth. A building which is designed and constructed with only floor space in mind is satisfactory for little more than a warehouse.

Among the most difficult projects in modern construction is mass produced housing. Even when desperate for a roof over their heads, people are reluctant to purchase a home that is like the other houses in the surrounding area. This is but one example of the urgent need of individuality which, so far, has not been solved successfully. Since the family unit is the backbone of American society, it is imperative that there be a healthy environment in which to bring up our country's youth. It is not beyond reason that an imaginative combination of variable prefabricated parts will solve this problem.

Among the many problems of today's architect, the most perplexing is concerned with the design of buildings which are consistent with prevailing economic conditions and still express freedom and respect for human dignity. In order to do this successfully, the architect must know and understand the nature of materials, machinery, and men, and then he must combine all three with order and simplicity.

The coming generation of architects will find construction methods and materials changing more rapidly than ever before in history. New and useful forms will constantly be introduced with exciting new developments in materials and structural skeletons. It is believed that a whole new structural concept will appear with revolutionary plastic materials which are reported to be stronger than steel. It matters little how great are these unique developments of science if they are not adapted wisely. They will have little or no lasting significance to civilization if we fail to use them honestly for not only the physical but also the spiritual needs of man.

Yes, it is this generation—my generation—which must place men and machinery in proper proportion and produce a living architecture which is a part of every man and his community. This is the challenge of the architect in the Twentieth Century. This I believe is my obligation to the new age.—***End.***

California Society of Professional Engineers—Annual Meeting, May 31-June 2, 1956, Modesto, Calif.

Georgia Society of Professional Engineers—Summer Meeting, June 1, 2, 1956, Dempsey Hotel, Macon, Ga.

Missouri Society of Professional Engineers—Annual Meeting, June 1-2, 1956, President Hotel, Kansas City, Mo.

Michigan Society of Professional Engineers — Annual Meeting, June 7-9, 1956, Detroit Leland Hotel, Detroit, Mich.

Arizona Society of Professional Engineers—Annual meeting, June 9, 1956, Tucson, Ariz.

South Carolina Society of Professional Engineers—Annual Meeting, June 23, 1956, Greenville, S. C.

Utah Society of Professional Engineers—Annual Meeting—June 27, 1956, Brighton Resort, Salt Lake City, Utah.

NSPE Fall Meeting — October 25-26, 1956, The Greenbrier, White Sulphur Springs, W. Va.

West Virginia Society of Professional Engineers—Annual Meeting, October 25-26, 1956, The Greenbrier, White Sulphur Springs, W. Va.

North Dakota Society of Professional Engineers—Annual Meeting, November 2-3, 1956, Grand Forks, N. D.

. . . *Mr. Trower*

I believe many things are conclusive in the development and actuality of being an engineer. I believe four things are the most conclusive and bring in all the factors desirable and advantageous in a good engineer. An engineer I believe above all should know his own field. I believe he should have high intelligence and should be able to get along with others well. Lastly he should have management qualities.

I believe an engineer should know his respective field of endeavor. Without this attribute, no individual has the right to call himself an engineer. I like to think of engineering as a profession, which it is. By using this terminology, I automatically stipulate that an education of the highest degree in the respective field is required. One of my instructors in high school gave me a formula for knowing a subject. I think it applies equally well here. "To know a subject, you must first know it so you can get a grade from your instructor; second, know that you know it; and third, be able to prove to others that you know it."

I believe an engineer should have a thorough working knowledge of his respective field of engineering to the point that he has confidence in himself, and to the point where he knows he can obtain any position open in his own field. If an engineer does have such confidence in himself, his clients will automatically have confidence in him. As an example, when we go driving over a beautiful bridge or ride the elevator to the top of a tall building, we don't wonder if the bridge will fall in or if the factor of safety in the building is insufficient to the point that the floor will cave in. We know that the bridge and the building are designed by responsible persons to be safe.

Secondly, I believe an engineer should have a high degree of intelligence just as a man must have who is to be a doctor or lawyer. Under this category comes intelligence that goes beyond the knowledge of his field. The engineer needs to be intelligent in the many other phases of life other than his work. He should be intelligent and active in social, civic, and religious affairs.

Social activities play a vital part in an engineer's development while in school and after he has graduated in making him an all-around citizen. One's social activities help to relax him and make him feel that he belongs. Even after an engineer has graduated and is established, social affairs offer him an opportunity to make himself known, attracting new clients and friends. As an example, if a business executive had to choose between two architects to design his new building, and he had met one of them at a party and was thus impressed by him, he would almost surely pick said architect.

Civic activities come mostly after graduation, but are just as important. I believe an engineer with his high degree of education has a duty to his community. Men of intelligence and open minds are an asset in any civic group, such as the Chamber of Commerce. Many times an engineer is closer to the problems of civic government and maintenance of city property, therefore making him the most desirable member of any civic group.

I believe, above all, an engineer should be educated and active in religious activities. I believe they are a must in any person's retinue of activities. Religious activities start, generally, with childhood and are usually carried through college, and should be carried through life with increasing crescendo. A man needs a religion to develop himself spiritually and morally, no matter what faith or denomination he chooses. It is a necessity to develop an over-all outlook of the world and to develop and continue his worship of God, showing his appreciation for the many blessings that God has heaped so lavishly upon us.

I believe a good personality plays a big part in any engineer's life. A good personality will win him clients and friends. An engineer must be able to sell himself to his employers. When an engineer graduates, he has his confidence and expects the employer to hire him on his transcript of grades and degree. I believe that an employer will immediately try to find out something about the graduate's personality. Of course his transcript will tell many things, but only time will tell if he can get along with the other employees. An employee can, if he has a sorry personality, be more of a hindrance than a help to a business.

I believe that any engineering graduate should have developed in himself an efficiency for taking responsibility and for being able to accept and do justice to a supervisory or managerial position. With an engineer's education, providing he can take responsibility, he can advance faster and be promoted into better positions than can other employees. An engineer can fill these positions better, too, especially in an engineering firm, as he would be more familiar with all phases of the work of the company.

In retrospect, I believe that a graduating engineer, and the employed engineer, as well, should have certain qualities that employers can use. I believe these qualities are essential: that of proficiency in one's own field of endeavor, of intelligence in most matters, that of a good personality, and that of taking responsibilities for a supervisory position. All these qualities equally apply to other professions, but I do believe they are qualities which I myself intend to develop and which should, in my mind, be found in any engineer's retinue of qualifications.—***End.***

An unfamiliar engineering problem? Consult the Professional Directory Pages 34, 35, 36, 37, 38

Letters

(Continued from page 5)

truck driver. The attendant would not have to go out in the cold or rain but could continue to read comic books.

It seems possible that the cost of the additional mechanism required for the change suggested above might be saved in the buttons and locking devices now in use, especially the one which lights up.

(Name Withheld by Request)
Detroit, Mich.

Traffic Troubles . . .

Dear Editor:

Congratulations on the progress in making the AMERICAN ENGINEER a real magazine for the professional engineer. The article on unity is one that we need, and the unity program is one that is of first importance. We seem to be making some pogress in this direction, though slowly, in California.

There is one minor error in the caption on page 10 (April, 1956) at the bottom. The Third Avenue elevated (New York City) had to be taken out of service and removed before it fell down, as the 75-year old structure had deteriorated to an alarming degree. The city was in a most peculiar position, as it had to suspend service before admitting this. But no more modern means of transit has replaced Third Avenue.

The city has a clear authorization from the voters to issue the $500 millions of bonds authorized to build the Second Avenue subway, and it was originally intended that this would come first. Delay by the present administration continues, and in the meantime the overcrowding on the East Side IRT line is worse than anything I have ever seen in 30 years in New York. About 37,500 get on at Grand Central between 5 and 6 p.m. and in that hour nearly 100,000 travel on this line.

This matter of mass transportation is one in which I believe that a valuable public service can be performed by our local chapters, with possibly some action at state and national levels.

W. H. T. HOLDEN, P.E.
Pasadena, Calif.

No Work for 'Free'? . . .

Dear Editor:

Mr. Boyd Campbell, president of the Chamber of Commerce of the United States, paints a beautiful picture in "The American Community and the 'Growth Profession'," printed in the April issue of the AMERICAN ENGINEER. In essence Mr. Campbell states that engineers are set apart in a "charmed circle" by their fellow men, that communities need our srevices, and that we have an obligation of leadership to our community.

No one can reasonably take exception to these words or ideas but as a veteran of seven years of service as a civil engineer for two cities, I feel an obligation to my

(Continued on page 45)

SUBJECT LISTING OF NSPE PUBLICATIONS

(Unless otherwise indicated publications listed below are FREE and may be obtained by writing to the National Society of Professional Engineers, 2029 K Street, N. W., Washington 6, D. C.)

CHAPTER ACTIVITIES

Monographs outlining various chapter functions have been prepared for the use of chapters: **Helping the Young Engineer, Ladies Auxiliaries, Promote Ethical Practice, Chapter Publications, Functional Group Activities** and **Meetings, Fellowship** and **Attendance.**

Welcome Mr. President—An informative booklet outlining organizational functions and suggestions for chapter presidents.

COMMUNICATIONS

How to Improve Engineering-Management Communications — Executive Research Survey Number One. Based on a survey of more than 300 companies employing engineers, this report contains information on engineering-management relations with respect to the lines of communication between engineers and management. Price $1.00 (members).

COMPETITIVE BIDDING

About Competitive Bidding—Reprint from American Engineer (NSPE Believes).

CONSULTING ENGINEERS

So You Want To Open a Consulting Office—Series of articles dealing with problems faced in opening a consulting office: By Way of Qualifications—John B. McGaughy, P. E., Operating Your Practice—Alfred J. Ryan, P. E., Ethical Problems—Francis S. Friel, P. E., Reprints from American Engineer, 20¢ each article—3 for 50¢.

CORPORATE ENGINEERING PRACTICE

Corporate Professional Practice vs. Individual Professional Practice — The Special Committee on Registration Law, NYSSPE. Reprint from American Engineer.

Should Corporations Practice Engineering?—Ronald B. Smith, P. E. and V. George Terenzio, P. E. Reprint from American Engineer. A discussion of the pros and cons of the issues involved in the debate over corporate practice of engineering.

CREED

Engineers' Creed—Suitable for distribution—free; for framing—50¢ each.

ETHICS

Canons of Ethics—Suitable for distribution—free; for framing—50¢ each.

Ethics and the Professional—Dean N. W. Dougherty, P. E. A study in human conduct. Reprint from American Engineer.

FEE SCHEDULES

Recommended Grades, Duties, Responsibilities and Qualifications for Pre-Professional and Professional Positions—Adopted by NSPE, June 1952.

Report on Fee Schedules—Revised October, 1954. A study of the Salary and Fee Schedule Committee of NSPE bringing together various schedules of fees and related practices of engineers in the consulting field.

FUTURE OF ENGINEERS

An Engineer's Report on the Future—Charles F. Kettering. The author tells how the engineering profession promises a better and more abundant life in the future. Reprint from American Engineer.

Engineers for the Future—Reprint from American Engineer (NSPE Believes).

GOVERNMENT

Engineers in Federal Government—Reprint from American Engineer (NSPE Believes).

NSPE Senate Testimony Treats Federal Salaries — Testimony presented before the Senate Committee on Post Office and Civil Service—Executive Director, Paul H. Robbins.

Our Function in Governmental Liaison—Reprint from American Engineer (NSPE Believes).

Engineers in the Federal Government—Reprint from American Engineer (NSPE Believes).

Policies Pertaining to Outside Practice by Professional Engineers Employed by Agencies of the Federal Government—Report by the Engineers-in-Government Subcommittee, Employment Practices Committee, covers policies of Federal agencies and establishes NSPE policy.

INDUSTRIAL RELATIONS

A Professional Look at the Engineer in Industry — NSPE Engineer-in-Industry Committee. A major publication of vital importance delving into all phases of the professional and economic status of that group which comprises the largest number of engineers in any functional field. Price $1.50 (members).

Professionalism or Unionism—Facing the Issue—Past President T. Carr Forrest, Jr., P. E. A discourse on the aspects of unionism for the professional. Reprint from American Engineer.

The Professional Engineer in Industry—Reprint from American Engineer. (NSPE Believes).

The Professional Union—A Contradiction—Past President Clarence T. Shoch, P. E. A discussion of the development of engineers' unions and the reasons why unionism is incompatible with professionalism.

LEGISLATION

Legislative Bulletin—Published monthly by NSPE; available to members upon request.

MANPOWER

How to Attract and Hold Engineering Talent — Executive Research Survey Number Three. This report reflects the experience of more than 200 companies which employ engineers and attitudes of 1,400 individual engineers who are employed in industry. Price $1.00 (members).

How to Improve the Utilization of Engineering Manpower—Executive Research Survey Number Two. This report pools the experience of more than 495 companies employing engineers on the subject of utilization of manpower. Price $1.00 (members).

MEMBERSHIP PROMOTION

Every Man a Debtor—Sixteen-page booklet explaining NSPE organization, programs, activities and objectives.

Membership Kit—This kit is available to membership chairmen and contains a general outline of membership campaign techniques and sample materials. Any of the publications listed in this outline are generally available for distribution to membership promoters as membership mailing pieces.

NSPE PHILOSOPHY

Engineering Societies of America—Paul H. Robbins, P. E., executive director, NSPE. Describes organization, programs, activities and objectives of NSPE. Reprinted from G-E Review.

Is Our Registration Requirement Limiting Membership?—Reprint from American Engineer (NSPE Believes).

Why a Professional Society? — Reprint from American Engineer (NSPE Believes).

NATIONAL SECURITY

Report of Special Committee on Engineering Manpower—Special report to NSPE Board of Directors, Spring Meeting, Charlotte, North Carolina.

ORGANIZATION

A Model Law for the Registration of Professional Engineers and Land Surveyors.

Model Constitution for Ladies Auxiliary Chapters.

Model State Society Constitution.

NSPE's Constitution and Bylaws.

POLICIES, NSPE

Professional Policies—Compilation of all present NSPE policies as adopted by the Board of Directors.

PROFESSIONAL DEVELOPMENT

Professional Development—The Responsibility of Industry and the Engineer—Conference Proceedings of 1955 meeting devoted to a discussion of the engineer in industry(Price $2.00 members).

The following three separate pamphlets are based on remarks of the 19th Annual Meeting:

NSPE's Development of Professional Objectives—Perry Ford, P. E.

The Need for More Effective Professional Action—Alex Van Praag, Jr., P. E.

The Place of Registration in Professional Development — Karl B. McEachron, P. E.

Professionalism in Industry: The Dow Story—Case history of professionalism in industry. Reprint from American Engineer.

PROFESSIONALISM

How a Professional Attitude Can Be Instilled in Engineers—Dean W. R. Woolrich, P. E. Reprint from American Engineer.

Some Thoughts on Engineers and the Engineering Profession—Speech by Harry A. Winnie, P. E., vice president, General Electric Co. (Retired), presented at the 20th Annual Meeting of NSPE.

PUBLIC RELATIONS

Engineers' Week—Reprint from American Engineer (NSPE Believes).

Our Public Relations Responsibilities—Reprint from American Engineer (NSPE Believes).

The National Engineers' Week Story—Review of nation-wide activities of Engineers' Week for 1955.

REGISTRATION

Is Our Registration Requirement Limiting Membership?—Reprint from American Engineer (NSPE Believes).

Next Step Registration — Informative pamphlet for engineering students and others on values and procedure for engineering registration.

Registration: Then, Now and Tomorrow—Frank H. Prouty, P. E., chairman, National Bureau of Engineering Registration. Reprint from American Engineer.

Professional Engineering Registration Laws—A compendium compiled by Alfred L. McCawley in cooperation with NSPE. Available from A. L. McCawley, Box 474, Jefferson City, Missouri—$8.75.

SALARY SURVEY

Digest of 1954 Salary Survey—Pamphlet highlighting the full report.

Professional Engineers' Income and Salary Survey — 1952 and 1954 statistics covering NSPE members — 50¢ each (members).

SOCIETY OPERATIONS

Annual Report of NSPE—Outlines in detail the functions and activities of the Society and gives a picture of its financial situation, with respect to income and expenses.

STANDARD FORM OF AGREEMENT

Standard Form of Agreement Between Owner and Engineer for Professional Services—Price—5¢ each.

TECHNOLOGY

The Case for Technology—Brig. General David Sarnoff. A factual answer to those who believe that the path of technology could lead to ruin. Reprint from American Engineer.

TRAINING

How to Train Engineers in Industry—Executive Research Survey Number Four. This report reflects the experience of more than 200 companies which employ engineers, as well as of many individual leaders in the training field. Price —$1.00 (members).

UNITY

Let's Take Warning From History—President A. C. Neff, P. E. Reprint from American Engineer.

Unity for Professional Action — Reprint from American Engineer (NSPE Believes).

VOCATIONAL GUIDANCE

Annotated Vocational Guidance Bibliography—Listing of current pamphlets and books of interest to counselors and prospective engineering students.

Do We Have Enough Engineers? Reprint from American Engineer (NSPE Believes).

Engineering . . . A Career of Opportunity—A general vocational guidance pamphlet.

Engineering . . . A Creative Profession Offering a Career of Opportunity—A general vocational guidance pamphlet for parents, teachers and counselors.

Engineering Horizons of Tomorrow—T. Carr Forrest, Jr., P. E. Reprint of a speech delivered at a High School Career Conference, University of Oklahoma.

Engineers for the Future—Reprint from American Engineer (NSPE Believes).

List of Accredited Engineering Schools—Reprint from ECPD Annual Report.

With Our Members . . .

St. Louis Group Sponsors Panel

"How To Become a Successful Engineer" was the title of a panel discussion held on a recent Young Engineers' Night sponsored by the St. Louis Chapter of the Missouri SPE.

Panel moderator was G. V. Williamson, vice president of Union Electric Co. Panel members and their topics were: A. S. Langsdorf, Dean Emeritus, Washington University School of Engineering, "The Educator's View and Objectives"; Kendall Perkins, vice president in charge of engineering, McDonnell Aircraft, "The Industrial Engineer's Viewpoint"; Willis M. Cooper, assistant general manager, research and engineering, Monsanto Chemical Co., "Management's Viewpoint"; and George M. Johnson, Jr., engineer, Maguolo and Quick, Architects, "A Young Engineer's Viewpoint."

Present at the meeting were junior and senior engineering students at Washington and St. Louis Universities.

Executive Secretary Named by Michigan SPE

President L. M. Dunn of the Michigan SPE has announced the employment of Richard M. Cosgrove as executive secretary.

In making the announcement, President Dunn stated that "continued growth in membership together with demands for additional services made it impossible to continue to depend entirely on the voluntary services of its officers and members."

President Dunn added that "employment of an executive secretary will free the elected officers for more constructive, long range planning."

Texas Chapter Hears School Head

Dr. Robert L. Williams, Superintendent of Schools, Corpus Christi, Tex., spoke at the May meeting of the Nueces Chapter of the Texas SPE on the subject of "Our School Planning Program."

Purdue Educator Talks On Professional Development

R. B. Wiley, Professor Emeritus of Civil Engineering, Purdue University, spoke on the subject of professional development at the April meeting of the Lafayette Chapter of the Indiana SPE. In his talk he reviewed the important stages in this development over the years.

Toledo Group Tours Scale Plant

A tour through the Toledo Scale Company plant was a feature of a recent meeting of the Toledo SPE. Project engineers from the firm conducted the tour and pointed out production facilities and custom built equipment manufactured by Toledo Scale. A turkey dinner preceded the field trip.

Engineers Hear Talk on Colorado

"Arizona and the Colorado River" was the subject of a talk by John P. Frank, Phoenix attorney, at a recent meeting of the Central Chapter, Arizona SPE. A former law professor at Yale and Indiana Universities, Mr. Frank is counsel for the Interstate Stream Commission.

Also at the meeting, newly registered engineers were welcomed into the profession by the State Board of Technical Registration.

NSPE Booklet Given Special Folder

The Missouri SPE has found an effective way to distribute the NSPE booklets, *Engineering—A Creative Profession Offering a Career of Opportunity*.

The Missourians pasted the booklets in an attractive paper folder which asks the question: "Say Frosh, are YOU interested in engineering?" Inside the folder are facts about the profession and a statement urging interested young people to write the MSPE for the names of registered professional engineers in their communities.

On the back of the folder is a list of the accredited engineering schools in Missouri.

Piedmont Chapter Hears H. E. Hicks

Hamilton E. Hicks, head of the Military Branch of the District Engineering Division at Charlotte, N. C., was the guest speaker at a recent meeting of the Southern Piedmont Chapter of the Professional Engineers of North Carolina held in that city.

Hicks told his audience that the cost of harbor deepening operations at Wilmington and Morehead City will be outweighed by benefits in future shipping.

NEWLY ORGANIZED SOUTH CAROLINA CHAPTER—The newly organized Charleston Chapter of the South Carolina SPE received a Charter at a special meeting held recently at the Fort Sumter Hotel in that city. Left to right are: Herman J. Williams, director of the Charleston Chapter; Fred A. Bailey III, secretary; T. Proctor Pace, secretary-treasurer of the SCSPE; Thomas A. Able, Jr., president of the SCSPE making the presentation; William L. Schachte, president of the Charleston Chapter receiving the Charter; Wilson E. Crews, state representative of the Charleston Chapter; Colonel L. S. LeTellier, chairman of the South Carolina State Board of Engineering Examiners and also a director of the Charleston Chapter; and R. K. Rouse, national director of the SCSPE.

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Atomic Expert Speaks in Indiana

Alexander Sesonske, associate professor of chemical engineering at Purdue University, was scheduled to speak on "Nuclear Power, Why, How, and When," at the May meeting of the Lafayette Chapter of the Indiana SPE. Prof. Sesonske has been associated with the Manhattan Project, and was a member of the Los Alamos Scientific Laboratory from 1950 to 1954.

The Indiana Society has also announced that William L. Sweet, a member of the Anthony Wayne Chapter, will assume the duties of executive secretary of the Society. He is a member of the State Executive Board and is serving as chairman of the State Registration & Law Enforcement Committee.

Ladies Organize In Nashville, Tenn.

Announcement has been made of the organization of The Auxiliary of the Nashville Chapter of the Tennessee SPE. The officers are: Mrs. A. W. Crouch, president; Mrs. Louis C. Daugherty, vice president; Mrs. A. D. McWhorter, Jr., 2nd vice president; Mrs. James C. Akers, 3rd vice president; Mrs. C. Faulkner Hickerson, secretary; and Mrs. A. Q. Campbell, treasurer.

P. E.'s See Adventure Film

"Adventure in Africa," a film about a 10,000-mile safari in search of wild animal stories, was the featured attraction on the program of the May meeting of the Milwaukee Chapter of the Wisconsin SPE.

The film was presented by Murl Deusing, showman and wildlife photographer.

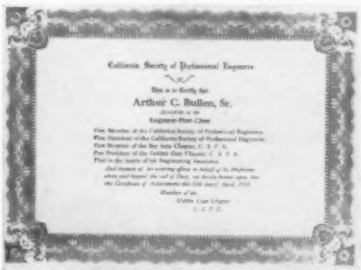
N. Y. Group Holds 'Practice' Panel

A panel discussion on the subject of "What Type of National Organization Can Best Serve Engineers in Private Practice?" was held May 16 at the Hotel Statler in New York City. The affair was sponsored by the New York Metropolitan chapters in conjuction with the 30th Annual Meeting of the New York State SPE.

Elies Elvove, consulting engineer and president of the New York Chapter, was scheduled to moderate the panel. The speakers were John K. M. Pryke, president of the N. Y. Association of Consulting Engineers, and John B. McGaughy, consulting engineer, of Norfolk, Va.

A. C. Bullen Given Special Award

A special certificate of achievement was presented recently to Arthur C.


California Society of Professional Engineers
This is to Certify that
Arthur C. Bullen, Sr.
Engineer-Past Client

Bullen, Sr., by the members of the Golden Gate Chapter of the California SPE. The certificate was given on the occasion of his retirement from active participation in engineering.

Structural Engineer Bullen was the founder of the CSPE, and he assisted in the formation of the first state chapter in San Francisco.

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Ladies Handle Chapter Dinner Meeting

The Ladies' Auxiliary of the Franklin County Chapter of the Ohio SPE planned and arranged the Chapter's April Dinner Meeting. William Price, of the Ohio Division of Natural Resources, spoke on "Vacation Areas in Ohio for Family Vacations."

Military Engineers Hold Annual Meeting

A symposium on industrial mobilization was sponsored by the Department of Defense at the 36th Annual Meeting of The Society of American Military Engineers, May 15, at the Mayflower Hotel in Washington, D. C. The program was conducted by Lloyd H. Mulit, Director for Requirements, Procurement and Distribution, Department of Defense.

Speakers from the Army, Navy, and Air Force discussed industrial mobilization as contemplated by each of the three Armed Forces.

Lt. Gen. Samuel D. Sturgis, Jr., Army Chief of Engineers, was the guest speaker at the Military Engineer Dinner held at the Army Map Service, May 14.

Rhode Island Holds Annual Meet

Rhode Island SPE members who attended the annual meeting of the group, May 15, at the R. I. Yacht Club in Providence heard NSPE President Allison C. Neff speak on "The Professional Engineer and His Standing in the Nation." A smorgasbord and dance was held during the evening session.

Ohio Group Presents Certificates

Registration certificates and Ohio SPE membership awards were presented at the May meeting of the Cleveland Society of Professional Engineers. The oath was administered by the Hon. Earl R. Hoover, Judge of the Common Pleas Court. The featured speaker was B. G. Kesting of the State Board of Registration.

Vincent DiMase, left, past president of the Rhode Island SPE, has been appointed building inspector for the City of Providence. He has served as deputy inspector since 1951. A civil engineer and a graduate of Brown University, DiMase is also a past NSPE national director from Rhode Island. He is Rhode Island editor of the *New England Professional Engineer* magazine. He is shown being sworn in by Mayor Reynolds, at right.

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Reading P.E.'s Present Annual Award

Ernest M. Gilbert, honorary chairman of the board of Gilbert Associates, Inc., has been selected as the recipient of the 1956 Engineer of the Year Award made by the Reading Chapter of the Pennsylvania SPE. The presentation was made at the May meeting of the group.

Guest speaker at the meeting was Norman V. Peterson, president of the American Astronautical Society. His topic was "Orbital Rockets and Space Travel."

Chapter Discusses "A Professional Look"

A panel discussion of "Our Professional Problems and Plans for the Future" was featured on the program of the annual meeting of the North Shore Chapter of the Massachusetts SPE. The discussion was based on the NSPE publication, *A Professional Look at the Engineer in Industry*, after which it was agreed to order twenty-five copies of the book for the membership.

Mercer County Survey Is Available

Announcement has been made by the Mercer County (New Jersey) Industrial Commission of the availability of the new publication, *Resources Survey of Mercer County*. The 117-page book gives a comprehensive picture of the Mercer County situation with regard to geography, population, labor, markets, transportation, and taxation and finance. Its purpose is to provide such data for the use of industries contemplating locating in the Mercer County area.

Copies of the *Survey* may be obtained from: The Mercer County Industrial Commission, Court House, Trenton 10, New Jersey. It has been announced by the director's office that no charge will be made for these to NSPE members.

Galveston Chapter Hears Career Program

A discussion on a proposed career guidance program for students interested in scientific and engineering careers was featured on the program of a recent meeting of the Galveston County Chapter of the Texas SPE.

Participating in the discussion were County school officials and members of the Chapter's Education Committee. School superintendents, high school and junior high school principals, and career guidance counselors were guests at the meeting.

Alabama P.E.'s Hear Talk On Dentistry

A discussion of the dental profession was featured at a recent meeting of the Birmingham Chapter of the Alabama SPE. Dr. Roy Davidson told his P.E. audience about the organization and problems of dentistry.

Briefs

(*Continued from page 7*)

in the contract division, won $500 for his article on "Shoreline Construction." John A. Anthes, process engineer in the same division, and E. N. Hower, manager of the machinery division's industrial department, divided $300 as co-authors of a paper entitled "Recent Developments—Sintering and Pelletizing." R. Dickey III, manager of marine sales in the engineering works division, won $200 for his presentation on "Development and Manufacture of Steel Shipping Containers."

A fourth award of $100 went to K. E. Lewis, electrical engineer in the engineering works division, for an article entitled "New Ore Unloader at Mobile, Alabama." Fifty dollar honorable mention awards for reports were won by C. R. Boyer, assistant operations manager of the engineering works division, and F. J. Larkin, plant engineer in the contracting division.

❁

F. L. Wilkinson Named ASME Fellow

Ford Lee Wilkinson, Jr., president of Rose Polytechnic Institute, Terre Haute, Ind., and a member of the Indiana SPE, has been elevated to the rank of Fellow of The American Society of Mechanical Engineers.

Two other leading engineering educators were named Fellows by the Society. They are George A. Hawkins, dean of engineering, Purdue University, and Milton J. Thompson, professor of aeronautical engineering and associate director, Defense Research Laboratory, University of Texas.

A nominee to the rank of Fellow must be an engineer of acknowledged professional attainment and have 25 years of active practice either in engineering or in the teaching of engineering at a school of accepted standing.

❁

Two-week Courses Offered In Sanitary Engineering

Two identical 2-week courses will be held this summer at the Robert A. Taft Sanitary Engineering Center at Cincinnati for training of sanitary engineer reserve officers from the Army, Navy, Air Force, and the Public Health Service.

Sponsored jointly by the Department of Defense and the Department of Health, Education, and Welfare, the courses are scheduled for June 4-16 and June 16-30.

The courses are specially designed for reserve officers normally on inactive status, and will provide instruction in emergency relief both in natural disaster and civil and military defense operations. Developments will also be covered in sanitary engineering fields including radiological health and water and air pollution control.

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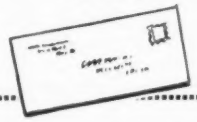

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NEW Processes . . .

Stud Welding Used In Composite Steel-and-Concrete Bridge

The emergence of stud welding as a new factor in reinforced concrete construction was highlighted recently with the erection at Fort Pierre, S. D. of the first composite steel-and-concrete bridge using end welded studs as shear connectors.

The engineering and design data which has led to the acceptance of Nelson granular flux-filled studs as shear connectors was based upon a comprehensive test program of stud welded shear connectors and fatigue tests of bare studs which were carried out in 1954 and 1955. The tests, conducted under the direction of Dr. I. M. Viest, Research Associate Professor, Department of Theoretical and Applied Mechanics, College of Engineering, University of Illinois, proved the studs were reliable and provided necessary design and loading data. On the basis of the tests, the stud dimensions recommended as being the most economical for shear connectors were $\frac{3}{4}$ and $\frac{7}{8}$-inch diameters and 4-inch length.

Approval has been given and the Nelson shear stud is now being shown as an alternate on bridges in design in 22 states where composite bridges are used.

In addition to the bridge work, Nelson stud shear connectors were used in the structural framework of the research laboratory recently erected by the International Business Machines Corporation at Poughkeepsie, N. Y. Seelye Stevenson Value and Knecht, New York, were the consulting engineers.

K. R. Scurr, bridge engineer of the South Dakota Department of Highways, designed the composite bridge erected over the Bad River at Fort Pierre. He pointed out that one of the principal reasons for substituting studs for the steel angles originally specified as shear connectors was the fact that studs permit concrete to be compacted more satisfactorily, so that interaction between the concrete slab and the steel beams is assured.

The Fort Pierre bridge is a continuous girder structure of five girders with shear connectors used in the positive moment sections of each girder. These sections are approximately 68 feet long for both end spans and interior spans. The width of flanges to which the studs are welded is 14 inches. A total of 8,300 Nelson granular flux-filled studs, $\frac{3}{4}$-inch in diameter and 4 inches long, with upset heads, were end welded to the girders in lateral rows of six.

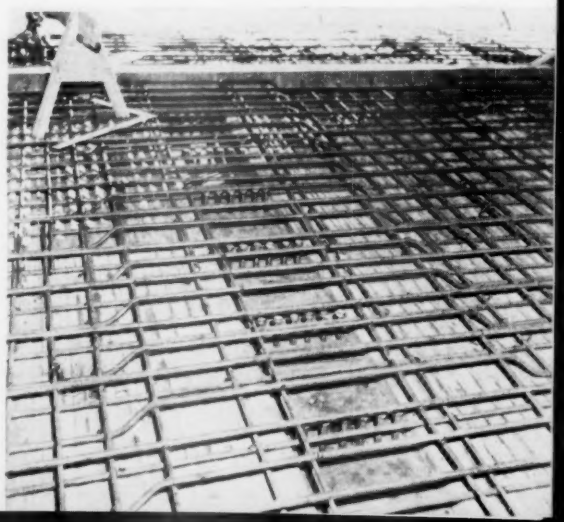
After the beams were in place at the bridge site, wooden falsework was erected and corrugated steel sheets, serving as a form for the concrete, were laid over the wood between the girders. The sheets, were left in place after the concrete was poured.

"From the standpoint of a bridge designer, Nelson shear connector studs permit a clean design with great flexibility in placement," Scurr said. "The studs may be spaced wherever required with practically no concern for the location of the transverse slab reinforcement."

The contractor found that the studs were convenient as aids in spacing mat for reinforcing bars. He was able to tack weld the spacer bars on the studs and to fabricate his mat in place with positive support to the spacer bars.

◀ **Use of Nelson granular flux-filled studs as shear connectors for composite bridges was shown on this bridge at Fort Pierre, S.D., where they were first used.**

▶ **Showing how the studs simplified the placing of reinforcing bars. Spacer bars were either tied or tack welded to the studs.**



Tube Serves As "Electronic Blackboard"

How the famed "Charactron" shaped-beam tube serves as an "electronic blackboard" is this country's widely-publicized Sage Defense System, and how it also is an "electronic typewriter capable of displaying as many as 10,000 characters per second, were explained at the opening of the main plant of Stromberg-Carlson, San Diego, which produces this unique electronic device.

The "Charactron" shaped-beam is somewhat similar to a television viewing tube, but instead of producing a picture on its screen it displays letters, numerals and other symbols, at a rate of 10,000 per second. It was invented by Joseph T. McNaey, who now is Director of Advanced Development of Stromberg-Carlson, San Diego.

Demonstrations which were staged in conjunction with the plant opening showed how the "Charactron" shaped-beam tube aids our national defenders against air attack by providing a continuous and accurate diagram of the attacking forces and of the available counter measures. The demonstrations also showed how the tube serves as an ultra-rapid method for displaying data provided by an electronic computer.

Testimony

(*Continued from page 24*)

known to all. We shall not repeat what Chairman Price referred to as "the gloomy statistics" in his excellent preface to the report, "Engineering and Scientific Manpower in the United States, Western Europe and Soviet Russia." We take it that this Subcommittee is particularly interested in the testimony of organizations with respect to what is being done to alleviate the problem, and, more importantly, what can be done.

Undoubtedly, this Subcommittee knows that the problems are not simple, and are not susceptible of easy answers. In the following comments, we have tried to identify the major aspects of the over-all problem and to offer what we hope are constructive thoughts.

The problem divides itself into two parts: (1) the immediate; and (2) the long-range. We recognize that colleges of engineering and science are immediately in need of considerable help, particularly in their graduate schools, to produce high-level scientists and engineers. It might be desirable, however, to deal first with the long-range aspects of this program.

Interesting Young People In Engineering and Scientific Careers

We all hope and pray that the day will never come in this country when a person is directed by governmental authority to engage in a certain field of study or work in a particular occupation. We all hold dear the idea of individual choice for our life's work. Our approach to inducing young people into certain courses of interest and need must be through incentives and an appeal based on a showing of the opportunity to make a worthwhile contribution to society with adequate rewards.

The National Society of Professional Engineers has engaged in work of this nature for many years. We have developed a relatively simple booklet which is designed to answer the questions young people most often ask about an engineering career. In addition, we have developed a somewhat more elaborated printed discussion for the use of parents, vocational guidance counselors, teachers, school administrators, and others who may guide the young people in choice of a career. These are made available to anyone interested without charge, and the demand has required the distribution of approximately 40,000 to 50,000 of the pamphlets a year. Much of the demand comes about as the result of the nation-wide publicity generated throughout the country during the observance of National Engineers' Week, which is sponsored by the Society. This observance has had the enthusiastic cooperation of industry, commercial organizations, governmental agencies, educational institutions and the press. It has reached almost everyone who reads newspapers and magazines or who listens to radio, watches television, or attends civic meetings. The observance has been stimulated each year by a message from the President of the United States, and by proclamations of governors and mayors. We are pleased too that members of Congress with engineering backgrounds have participated.

This is only one method of stimulating interest in an engineering career. Many organizations have career stimulation programs of various types, including the organization of engineering clubs in the high schools, speakers at career guidance days in the schools, conferences with parents and teachers, etc. Many of our local community chapters sponsor and participate in such programs. We suggest that this type of work must be continued and expanded by private organizations. We are confident, based on past experience, that such programs will receive the cooperation of the press, radio and television.

Last year our Society president sent a special message to all the newspaper publishers in the United States calling attention to the mathematics and science situation in high schools and asking for their assistance in publicizing the needs. The response was most favorable and produced many editorials, feature articles, news stories dealing with the situation nationally and in the local communities in terms of available educational facilities in engineering-related courses and teaching personnel.

Inducement Through Professional Status—

Career planning involves more than the opportunity to serve society and to obtain adequate rewards in a monetary sense. It also includes a morale or prestige factor, particularly for those in a professional field, such as engineering. Unfortunately, too often in the past, and to some extent it is true today, engineers and scientists have not been given full professional recognition. For the young person thinking of a professional career, it is important that a proper climate be established and made known. Our Society is engaged most actively in a broad range of programs which deal with this objective for engineers in all fields of employment.

The need for this type of recognition is just as important to Government as to industry or in private consulting practice. For this reason, we suggest that this Subcommittee may be interested in appropriate corrective action on the part of Congress to restore to professional engineers and scientists in the Federal service the professional classification which was lost when such personnel were placed in the General Schedule in 1949. Representatives Moss and Gubser of the Post Office and Civil Service Committee have announced that they are planning to introduce bi-partisan legislation to establish a new Professional Schedule for engineers and scientists with appropriate grades and salaries. Such action on the part of the Federal Government would undoubtedly exert a strong influence on other governmental units and on private industry.

The Need for Scholarships and Other Financial Aid—

The members of the Subcommittee are aware, of course, of the large number of bills now pending in Congress which would authorize Federal scholarships, or loans in some cases, for the purpose of providing the financial means for young people to engage in formal study of engineering or scientific subjects. All of these bills are predicated on the belief that the failure of many of our young people to engage in such study flows from the lack of financial means. There can be no question that the lack of funds is often the cause of promising young people not obtaining higher education.

However, we think that there is insufficient evidence available today to indicate clearly whether there are enough available scholarships to meet the needs of those who are qualified for and would take engineering or scientific courses except for financial reasons. In any event, it would appear that there is insufficient information available and publicized regarding scholarship opportunities. Perhaps it would be in order for the National Science Foundation to compile as complete a list as possible of engineering and scientific scholarships and give it wide publicity through normal channels of Government and through the cooperation of engineering and scientific organizations.

We are aware of the strong sentiment of many, including Congressional leaders, that financial aid by the Federal Government should be delayed no longer and that in the long-range interest of national defense a Federal Scholarship Program should be instituted as soon as possible. It must be made known to the Subcommittee, however, that there are many of the engineering profession, including a number of engineering educators, who feel that a Federal program should not be instituted at this time. To the contrary, they feel that every effort should be made to stimulate the needed funds from other sources.

There are some things, however, which we feel can be recommended with general support in this area. One pending group of bills calls for an amendment to the tax laws to permit a thirty per cent credit against individual income tax for amounts paid as tuition or fees to institutions of higher learning. Such action would undoubtedly make it possible for some parents to send their children to college who cannot now afford it. Within recent days there have been published reports that the Federal Government may conclude the present fiscal year with a substantial surplus. If so, and if Congress is disposed to reduce tax burdens based on improved Federal revenues, it may be desirable to consider applying some of the tax relief in the manner indicated, and at the same time give encouragement for more enrollment in the colleges and universities.

Representative Ruess of Wisconsin has introduced a bill which would permit corporations to deduct from their tax returns an additional five per cent for contributions to accredited technical schools or schools of engineering. The corporations are, of course, one of the important sources of funds for engineering and other institutions of higher learning. The statistics indicate that relatively few corporations are now giving amounts equal to the permitted five per cent for educational and charitable purposes. However, for those few corporations which have made gifts to the limit of the allowable deduction and would give more if permitted to do so on a tax-deductible basis, consideration should be given to such legislation as a further inducement for private financial support.

The Shortage of High School Teachers—

We are sure that the Subcommittee has heard of the very serious problem that the elementary and secondary schools are woefully short of qualified teachers in the mathematical and physical science fields. The engineering educational institutions as a result receive far too many freshmen engineering students who lack basic education in subjects necessary to an engineering career. It does us little good to decry this

(*Continued on page 43*)

INVENTION

If the works of the great poets teach anything, it is to hold mere invention somewhat cheap. It is not the finding of a thing, but the making something out of it after it is found, that is of consequence.—*James Russell Lowell.*

STRICTLY BUSINESS

Personalities . . . **Walter M. Hassenplug** has been named director of engineering for **Acme Industries, Inc.,** Jackson, Mich. . . . The appointment of **W. Frank Bort** as manager of industrial construction, and of **Stanley Kimball** as manager of heavy construction for the Kaiser Engineers Division of the **Henry J. Kaiser Company** was announced by **George Havas,** vice president and general manager. . . . **Richard M. Wood,** of Foxboro, Mass., has been promoted to construction manager for **Stone & Webster Engineering Corporation** . . . The appointment of **John H. Carter** as associate research director of **Lockheed's Missile Systems** division has been announced by **Hall L. Hibbard,** general manager . . . **Albert Raitzer** has been added to the staff of the **Trane Products Engineering Department** as a project engineer, according to **R. E. Lucey,** company vice president and manager of engineering. . . . **F. Parker Westerberg** has joined **Greer Hydraulics, Inc.,** of Jamaica, New York, as sales engineer.

Mr. Hassenplug

Andrew F. Kritscher has been appointed manager of engineering for **Kaiser Aluminum & Chemical Corporation. . . . Dr. Clarence F. Kooi,** former project engineer at Collins Radio Company, is now with Lockheed's Missile Systems Division in Van Nuys, Calif., as a senior scientist. . . . **Albert W. Strahorn** has been appointed director of explosives production for the **Atlas Powder Company,** it was announced by **D. J. C. Copps,** vice president in charge of explosives. . . . **Charles R. Gates** has joined the **L. B. Foster Company's** Atlanta office as a technical consultant on relay rail. . . . **Dr. Paul Wildi,** formerly chief engineer for the **Pacific Oerlikon Company,** has been appointed consulting engineer for the **Pacific Switchgear Division, Federal Pacific Electric Co.,** according to **A. A. Browne,** vice president. . . . **George J. Miller** has joined the Customer Service Laboratory of **Houghton Laboratories, Inc.,** Olean, N. Y., as applications engineer. . . . The appointment of **Robert L. Hall, Jr.** as wire and cable specialist for **General Electric's** Construction Materials Mid States district has been announced by **R. C. Dean,** manager of sales operations. . . . **The Garrett Corporation** has announced the promotion of **Jack Wright,** former sales manager of the Aero Engineering Division, to the position of assistant manager. . . . **Charles F. Trapp, Jr.,** has been elected vice president in charge of sales, and **L. T. Szady** has been elected vice president in charge of engineering, for the **Formsprag Company,** Van Dyke, Mich. . . . **B. E. Anderson** has assumed the position of chief engineer of the Federated Metals Division of the **American Smelting and Refining Company**. . . . The election has been announced of **Henry K. Norton** as chairman of the board of directors of **Walter Kidde Nuclear Laboratories, Inc.,** Garden City, Long Island. . . . **Joseph C. Shumacher,** director of research for the **American Potash & Chemical Corporation,** has announced the appointment of **Dr. Thomas W. Clapper** as associate director of research at the firm's Henderson, Nev., plant.

John R. Morss, associate with the engineering consulting firm of Price and Anderson, San Francisco, has been named chief chemist of the **Texas Portland Cement Company** of Orange, Texas, according to **Kent B. Diehl, Sr.,** Texas Portland president. . . . **H. L. Watchous,** of Houston, Texas, has been named construction manager of **Tellepsen Petro-Chem Constructors,** according to **Emory E. Gose, Jr.,** vice president. . . . The appointment of **Robert G. Page** as plant manager of the North Hollywood, Calif., plant of **General Electric's** Distribution Assemblies Department has been announced by **C. K. Skinner,** the department's manager of manufacturing. . . . **Charles W. Boyle** has been appointed the Philadelphia district manager for **Plasteel Products Corp.,** with offices in Upper Darby, Pa. . . . The promotion of **Hugh Richmond** to the sales engineering department of the **Hyster Company's** Eastern Industrial Truck Division at Danville, Ill., has been announced by **Phillip Hill,** vice president in charge of sales. . . . **J. E. Buchanan,** president of **The Asphalt Institute,** has announced the transfer of **Dillard D. Woodson,** district engineer at Atlanta, Ga., to the headquarters engineering staff of the Institute at College Park, Md. . . . **Robert J. Bricmont** has been named manager of the engineering service department of the **A. M. Byers Co.,** Pittsburgh. . . . **James C. Loucks** has been appointed to the Research Laboratory staff of the **American Society of Heating and Air-Conditioning Engineers,** it was announced by **Prof. Burgess H. Jennings,** research committee chairman. . . . **Richard Hodgson** has been named executive vice president of **Fairchild Camera and Instrument Corporation,** according to **John H. Clough,** president. . . . **Ello E. Richardson,** of Medford, Mass., has been appointed general manager and a director of the **Cambridge Gas Company. . . . Robert W. Marvin** has been elected a vice president of **Dravo Corporation,** Pittsburgh.

Mr. Boyle

Mr. Bricmont

Operational Expansion . . . **Colonial Iron Works Company,** Cleveland, has established the **Bollard Asphalt Plant Division** to handle design, sales, manufacture, and erection of a complete line of asphalt plants and component units, according to **Allan P. Stern,** Colonial president. . . . The Silicone Products Department of the **General Electric Co.** at Waterford, N. Y., has acquired more than 60 acres of adjacent land to provide room for a planned expansion of production, research, and administration facilities.

Testimony

(*Continued from page* 41)

situation which is not the fault of the schools, but is directly related to the teacher salary problem. What can be done about it? We must somehow provide the funds necessary to attract and retain competent teachers in these subjects.

The Subcommittee might like to consider that the Federal Government could provide fellowships for graduates in engineering and science who have attained a Bachelor of Science degree in the field of engineering, physics, chemistry or mathematics. These men would obligate themselves to a period of three years to teach courses of general science and mathematics in high schools. Their salaries would be supplemented by Federal appropriation beyond the amount normally paid high school teachers. In addition, they would be eligible at the end of their three years of teaching to a fellowship which would enable them to attend the institution of their choice for three years and obtain a Ph.D. degree in their field of specialization. This cost would also be borne by the Federal Government. At the end of this period, there would be several thousand young men who had achieved the highest collegiate degree and who would have had three years of teaching experience in high school and who would make an excellent pool of talent for college faculties. Undoubtedly, many with this background would wish to continue their teaching career. This would serve the double purpose of supplementing science teaching in high school and provide a future nucleus for college faculties. It would probably be desirable that this program be administered by the National Science Foundation.

Another suggestion has been made that assistance on this problem might be given by industry and other users of engineering services by making available on a part-time basis engineers and scientists who can devote a few hours a day, or week, to teaching duties. This proposal has a number of complications, and our Society, together with other interested groups, is currently studying the feasibility of this proposal. If this seems practical, the local chapters and state societies of our organization will conscientiously work with local boards of education and industry to make such personnel available.

Problems of the Engineering Schools—

Recently, Dean John W. Whittemore of Virginia Polytechnic Institute in his capacity as chairman of the Engineering Division of the American Association of Land Grant Colleges and State Universities, completed a survey which reveals a widespread shortage of teachers and facilities in the engineering schools. This survey shows that while most engineering schools are continuing to admit all qualified applicants, some are already turning away qualified students because the college lacks faculty, and the necessary classroom and laboratory space for instruction. The retention of qualified teachers in the colleges has become a major problem because of the higher salaries offered by industry which the limited financial resources of the schools cannot match.

We would like to stress as strongly as possible that if Congress should adopt a Federal Scholarship Program, consideration should be given to the fact that tuition does not cover the full cost of the education. A substantial increase in enrollments will mean, among other problems it creates, a further deterioration in the financial ability of the university. Any large-scale scholarship program should provide adequate grants to the school itself to cover the deficit between tuition and total educational and operating costs.

In the August 1955 issue of our Society's magazine, the AMERICAN ENGINEER, appeared an article by me entitled, "National Defense Begins in the College." I venture to mention this because there is a point made therein which is fundamental to the problem before this Subcommittee and pertinent to a discussion of the problems of the colleges. The point is based on the undoubted fact that we must be interested in the quality of our engineers and scientists as well as the numbers turned out each year. More recognition should be given to this vital fact, and in doing so, we must recognize that under today's complicated technology, graduate work for those qualified for it is a necessity to develop the kind of top-level scientists and engineers who can generate new ideas in uncharted areas. If we concentrate all our attention on producing large numbers of engineers and scientists, and neglect the gifted who are qualified for advanced work we are heading for technological disaster.

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In that article I said: "Of the 1800 colleges in the country, perhaps between one and two hundred have sizeable graduate schools capable of conferring sound doctoral degrees in engineering and science. . . . Such graduate schools cannot be established overnight, regardless of the amount of money made available. It would be well to nurture and expand the schools that have already proven their worth."

I noted that graduate work is the most expensive type of university education. The colleges have recognized the paramount importance of turning out a larger number of well-educated Ph.D's, and have striven mightily against great handicaps, but the iron pressure of inadequate budgets has forced them into many compromises. They have accordingly welcomed the opportunity to obtain sponsored research where all, or part, at least, of the cost can be earned by their own efforts.

Many of the research contracts come from the Federal Government. This would be all to the good, but we are faced with the anomaly that the more Government research performed the beaker become the colleges financially. This results from the fact that the Federal policy is that research contracts should be given to colleges on the basis of the so-called "dollar in, dollar out" theory. That is, the Government pays only the actual cost of the research itself. Every business has indirect costs as well as the direct costs of labor and material, and if that business does not recover its indirect cost, plus a profit, it will not long exist.

Again, quoting from my article: "The bulk of the two billion or more being spent by the Government for research is funneled through the Department of Defense. The part of this which is farmed out to the colleges is theoretically contracted for on the dollar in, dollar out basis. An allowance is made for indirect costs as well as direct costs. The allowance, however, is seldom sufficient to repay the indirect costs of the institution. After various studies and negotiations have been completed by Government personnel to determine the indirect charge allowance, it is still possible that there will be disallowances for bills rendered although the funds were actually spent in performing the contract. The total result of the negotiation is to reduce the income from the project so that very rarely does the institution recover even the money it has spent to do the work."

If it is consistent with your Subcommittee's policy, I will submit the entire article for the record. Certainly one of the most helpful things this Subcommittee could do to help meet the problems of the universities is to use its influence to bring about a more generous and realistic policy on the part of the Federal agencies in connection with Government-sponsored university research.

A very pertinent and timely suggestion, which could be implemented immediately, has been made by Admiral Rickover. He suggested that industry might take some of its engineering and scientific personnel and return them to college faculties on a leave of absence basis for perhaps two or three years.

To add some amendments of our own, it would probably be desirable to select those men in industry who have had previous experience in college teaching. These men would not be drawn from those areas of industry now producing systems or weapons of defense for the United States, but from areas contributing to the comfort, convenience and amusement of the public. It will probably be necessary to provide incentives to industry to make this program workable. The selection of such incentives can probably be made best by this Subcommittee; but, as a suggestion, twice the individual's present salary might be allowed as a business deduction from taxable income of the company providing his services.

It is, of course, understood that the individual would continue to draw the same salary as he had been enjoying in industry. These men could probably be utilized by the colleges in their graduate teaching and research, particularly for the guidance of the theses required for Ph.D. degrees.

As we indicated in the beginning and as we are sure that this testimony has developed, this is an exceedingly complicated problem with many facets not susceptible of immediate solution. It is also apparent to us, as we think it is to this Subcommittee, that the Government and the Congress of the United States will be increasingly interested, involved, and responsible in working toward solutions and improvements. For this reason, we think it would be pertinent for Congress to give serious consideration to the suggestion of Senator Thye and the others who have co-sponsored the recent bill to establish a Congressional joint committee on scientific research to deal specifically with the problem of training adequate manpower in the scientific and technological fields. As we understand this proposal, the joint committee would be bi-partisan and would be non-legislative. This would be desirable on both counts as it would permit such a joint committee to engage in high-level studies with adequate staff, and particularly to relate the technological manpower problems to the over-all

(*Continued on page* 45)

...NEW LITERATURE...

To help the offering firms determine which literature you require, when requesting an item, be sure to list all specifications shown . . . and say you saw it in the AMERICAN ENGINEER.

ALUMINUM—"Casting Aluminum" is a new technical handbook just issued by Reynolds Metals Company to expand its library of technical literature. It includes clear and concise information to help the designer select the casting process and the aluminum alloy best suited to meet the requirements of the product. Data on typical mechanical properties are also presented. After a brief discussion of the important features of aluminum castings and the three most common casting methods . . . sand casting, permanent-mold casting, and die casting . . . the book explains the various pig and ingot classifications used by the industry and the effects of the common alloying elements used with aluminum. Then the many different alloy classifications are discussed and their principal characteristics presented. The next chapter gives data on the complete series of master alloys and hardeners. A separate chapter is devoted to each of the six main casting methods: Sand casting, permanent-mold casting, die casting, centrifugal casting, plaster-mold casting, and precision investment casting. Important factors involved in each method are carefully explained. Trimming, cleaning, heat treatment, machining, surface finishing, quality control, and salvage are also presented in detail. Twenty-three tables in the book offer a wealth of information including chemical composition limits for the various alloys, typical mechanical properties at room and elevated temperatures, fabricating characteristics (weldability, machinability, etc). Other tables present recommended cuts, feeds, and speeds for machining aluminum castings; typical heat treatments; typical core sand mixes; permanent-mold and die-casting tolerances for aluminum alloys; pattern maker's shrinkage for sand castings in various metals; and a comparison of weight of aluminum with equal volume of other metals. The table of contents in the book is supplemented by an index of the tabular data and a 9-page itemized cross index. This 130-page 6 x 9-inch handbook is ring bound to lie flat when open. It will be sent without charge to those requesting it on company letterhead. Address requests to Reynolds Metals Company, Desk PR4810, 2500 South Third Street, Louisville 1, Kentucky.

—AE—

HEATING-COOLING—A new 12-page booklet with flow charts in colors has been issued by the A. I. McFarlan Company, Inc. of 90 West Street, New York covering their "Staged Cycle" and "Closed Reversing Cycle." The staged cycle describes a means developed by the McFarlan Company, and covered by patent applications, whereby compressors can be staged in conjunction with the use of a wide range coil. The horsepower required for the first stages is said to be very substantially reduced compared with ordinary air conditioning methods. The reversing cycle is a new heat pump application involving two condensers, one for the cooling tower circuit and a second located in the chilled water circuit in such a way that a single pump provides heating or cooling through two streams of water to each coil. The bulletin may be obtained by writing to the A. I. McFarlan Co., 90 West Street, New York 6, N. Y.

ELECTRICAL SYSTEMS—General Electric has two new booklets available. One, entitled "Systems Engineered Equipment For Industrial Plants," Bulletin GED-3039, 48 pages, gives information on distribution system planning, features, advantages, application, operation and other data on system-engineered equipment for industrial power distribution. The second, "System Engineered Equipment For Commercial Buildings", Bulletin GED-3038, 40 pages, discusses new 480Y/277 volt distribution systems giving similar information for commercial power distribution. Request bulletins by number and title from General Electric Company, Schenectady 5, N. Y.

MOVIE

A new 21-minute color and sound 16 mm. motion picture "Digging for Profits" has just been produced by the Gradall Division of The Warner & Swasey Company showing the machine on a wide variety of applications from floodway projects to highway construction and maintenance, and general contracting jobs.

Now available for showings before groups through arrangements with Gradall distributors throughout the United States and Canada.

RELAYS—Relays of the same types that have given long and reliable service in telephony over the past half-century now are being made available for industrial applications by Stromberg-Carlson, a division of General Dynamics Corporation. The Stromberg-Carlson relays are available in six general types, most of them with a number of variations. Industrial Bulletin, "Relays" is available from E. R. Sears, Industrial Sales Manager, Stromberg-Carlson Company, Rochester 3, N. Y.

—AE—

PUMPS, VALVES—McNally Pittsburg has just issued a centrifugal pump and valve bulletin. It gives technical data on all their various sizes of pumps and valves. Included in this 20-page bulletin is a complete description with photographs, dimension drawings, data tables and performance curves. Bulletin number 1055 will be sent free on request to McNally Pittsburg Manufacturing Corporation, Pittsburg, Kansas.

—AE—

RADIANT HEATING—"Radiant Heating Construction" is the title of a special report just prepared by the Engineering Service Department of A. M. Byers Company. The new report, an illustrated eight-page bulletin, is designed to help engineers, architects, and others interested in accepted installation procedures for radiant heating systems. Arranged in logical order of preference are sketches of various types of radiant heating construction. Contained in a one-page digest of construction recommendations are discussions of floor surfacing, heating slab, radiant heating coils. A copy of "Radiant Heating Construction" can be obtained by writing to A. M. Byers Company, Box 1076, Pittsburgh 30, Pa.

SELECTING SIGNALS—A comprehensive summary bulletin on the proper use of modern visual and audible signals for industrial manufacturing plants of all types has been published by Federal Sign and Signal Corporation, of Chicago. Citing the three major factors in the selection of any signal, Federal's engineers set forth (1) purpose signals are to serve; (2) areas to be covered; and (3) noise levels to be overcome. The special bulletin then covers the purposes of General Alarm, Start and Dismissal, Coding or Paging, and Danger Signals for outdoor areas and indoors over large expanses of roofed-in plant space, or smaller partitioned manufacturing and shop area. A novel "Signal Selector" wheel was designed for the bulletin to comprise a handy guide to help select the best signal for specific industrial or office functions. Copies may be secured from Folger M. Smith, Manager, Signal Division, Dept. PR, Federal Sign and Signal Corporation, 8700 South State Street, Chicago 19, Illinois.

—AE—

ROLLER BEARINGS—A new 72 page Catalog on Shafer Self-Aligning Roller Bearings has just been published by the CHAIN Belt Company. Describes the Shafer Self-Aligning principle of concave rollers running between convex raceway, the Shafer Micro-Lock Adjustment and Shafer "7" Seal, etc. Includes completely revised engineering data, new load rating tables, exploded view for parts identification, etc. For a copy of this new Catalog write CHAIN Belt Company, Milwaukee 1, Wis.

—AE—

DIGITALS—A new 28-page catalog, with illustrations, charts and characteristics of its full line of precise automatic digital measuring instruments, has just been published by Non-Linear Systems, Inc. Contains information on NLS digital voltmeters, digital ohmmeters, digital readouts, data reduction systems, peak reader systems, digital recording systems, AC-DC converters and binary decimal converters. It also has a section devoted to principles and applications of the digital voltmeter. Free copy available by writing Non-Linear Systems, Inc. Del Mar Airport, Del Mar, Calif. Specify Catalog 356.

—AE—

VIBRATION, NOISE CONTROL—A new, illustrated publication entitled "The Plant Engineers' Guide to Machinery Mounting, Vibration & Noise Control" discusses such important problems as: Machine mobility, eliminating floor bolts, leveling machines, eliminating rejects, controlling vibration and noise. The Bulletin, designated K6A, shows by means of case histories how these problems are being solved by using isolation media like steel springs, cork, and rubber. A selector chart telling the exact cost of vibration and noise control mountings for 215 of the most commonly used open back inclinable Punch Presses. The unique arrangement of this chart enables users of presses not listed to determine the cost of the mountings simply by using the data given for presses of similar capacities and weights. Copies of the Bulletin are available free of charge from the Korfund Company, Inc., 48-23R 32nd Place, Long Island City 1, New York.

These listings are informational only and are not an endorsement of the products, nor of the manufacturer's claims.

Letters

(*Continued from page* 31)

profession to present some sober observations from my own experience. In the Book of Genesis of the Bible is the account of Jacob who served Laban for seven years on the promise that he would receive the hand of beautiful Rachel in marriage. At the end of the seven years, Jacob got Leah instead of Rachel. Now, in the Bible, Jacob was talked into working another seven years for Rachel's hand. Not so in my case.

After working my seven years I removed myself from municipal engineering with little more than seven years of very unremunerative experience and with the determination to make sure that other young engineers did not make the mistake which I made. In private employ I receive forty per cent more pay than for city work. The merchants, the realtors, and the people profited from the streets, the sewers, the storm drains, the water supply, the buildings, and the bridges, but at election time, like Laban, were unwilling to pay the bill.

I do not agree with Mr. Campbell that the answer to this condition is more service, and more and consequently cheaper engineers. My answer to a professionally marginal situation: one, get out; two, tell other engineers about the condition so that they won't fall into the trap; and three, support your professional organization. Certainly this is a negative conclusion from seven years of city work including evening meetings and community service. The merchants who sold goods produced by our machinery, hauled over roads built by us, who were protected by our storm drains and sewers and water supply, their goods sheltered by buildings built by us could yet find no way to adequately remunerate the city engineering force. I don't see how more service, more salesmanship, more engineering and more engineers can possibly be indicated here as a cure for this situation.

It is good to be positive, to speak constructive words, to help, to build, to encourage to devote our time to the profession and to the civilization. We rise together and fall, too; yet there are areas of our profession where flagrant underpayment exists. Salary polls have repeatedly pointed out municipal employment as the bottom of the pay totem pole. Our cities are our glory, they contain the majority of the material improvements and facilities of our civilization. In these cities, the greatest possible monument to engineering, we are told we must give more and more. That's fine, but if what we have given gets us less pay than an organized truck driver, we are going to have to give quite a bit more than we have.

It looks like what we have been doing is not getting us what we want and more of the same is not very good sense. Just where is the wealth created by our machines and improvements going? Do we know? Certainly Mr. Boyd Campbell knows in part. Business is good but engineering business is bad, so bad in fact that it has reached the ears of youth and we find ourselves short of young men who wish to enter engineering. It would seem better for the profession to spend time telling young men to stay out of cities which will not pay adequately than to spend time giving free engineering advice to these cities. The first course of action tends to the improvement of the engineers' lot, the other only prolongs existing depressed conditions. We cannot just "sell" young men engineering, we have to be prepared to back them up after they become engineers, steer them away from the pitfalls, close ranks when they stumble, show them that a profession hangs together one for all and all for one.

We cannot bicker and quarrel or cast aspersions on other engineers if we wish them to "catch" professionalism. The older established engineers basking in their reputation might well give public service after personal attention to the problems of the younger engineers and not before. Too often young engineers hear more professionalism than they see acted out. One instance of non-professional conduct harms the profession more than a score of public speeches can cure. Let's close ranks and attend to our own. It does not seem reasonable to speak of solving the problems of a city for "free" when we have not yet found a way to solve the economic problems of our own members.

FRANCIS G. YATES, P.E.,
Colorado Springs, Colo.

Testimony

(*Continued from page* 43)

legislative problems handled by the other committees and by the Congress as a whole.

Mr. Chairman, we hope we have developed some points pertinent to the hearing which deserve consideration; and we hope that we have made some suggestions which are worthy of your further study. The National Society of Professional Engineers, along with the many other fine organizations which have appeared before you, deeply desires to cooperate in every possible way to aid your Subcommittee in the important task it has assumed. We appreciate the opportunity to appear before you and to try to help develop some answers to a problem which is paramount in our national life.—***End.***

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Seaway

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small stimulant to trade and employment. The public works aspect of the project is highly important. The job will absorb astronomical amounts of cement, lumber, steel, copper, and other materials. Huge fleets of equipment of all types have been assembled for the vast earthmoving job now in progress. The building of great power stations will require huge amounts of equipment in the way of turbines, generators, control apparatus, transformers, transmission lines, and equipment. About 70,000 man-years of labor will be invested in the job, on and off the site, with payroll expenditures of great magnitude.

The discovery of rich new deposits of iron ore in Canada gave added urgency to the St. Lawrence development. The high-grade ores of the Labrador range will move in considerable volume, possibly as much as 30,000,000 tons per year, westerly to the steel producing centers of the Great Lakes. The underlying threat to the stability of steel production in the Great Lakes area, which grew with the approaching depletion of the Mesabi Range, has largely been removed by the discovery and development of the rich, new iron desposits in Labrador and Quebec, north of the St. Lawrence. About $300,000,000 has been invested, and great obstacles overcome, in a related engineering project, the exploration of the Labrador iron range, and the building of a railroad over 300 miles of the toughest terrain in the world, to move iron ore from the Ungava deposits to a new shipping port, Seven Islands. The public is hardly aware of the building of the Quebec, North Shore & Labrador Railway, through 300 miles of howling wilderness, which represented the first large-scale railroad building in North America since 1900, except for the Hudson Bay Railroad from Winnipeg to Churchill, completed in the mid-1920's.

It seems inevitable that the Great Lakes area will be much more attractive to all types of industry with the St. Lawrence development, than heretofore. The direct movement of deep draft lake and ocean vessels will permit industry to move raw materials in large quantities more effectively; to reach out for raw materials from overseas; and to reach export markets on the basis of favorable freight rates. The Seaway should serve to make present industrial establishments in the lake region more secure, and should be a magnet to bring new industry to the region.

North and west of the Great Lakes Basin, lies one of the richest agricultural areas in the world. Meat, dairy goods, fruit, vegetables, and grain flow from this horn of plenty in a golden cascade. After continental needs have been met, there remains a great surplus of food stuffs available for movement to Europe and to other parts of the world. The farmers of Canada and the United States have always been ardent champions of the Seaway, believing that both their basic imports and their agricultural production would move more cheaply to and from world markets over such a waterway. As North American agricultural productivity increases, and as world standards of living slowly rise, the Seaway would seem to serve a great natural purpose in bringing these elements together effectively.

With few exceptions, the port cities of the Great Lakes have long sought the Seaway because of its expected and highly beneficial maritime impact. These ports long visualized large ocean vessels traversing the St. Lawrence and bringing new cargoes to their docks. There has been an irresistible lure to the thought of inland lake ports becoming seaports on "America's new fourth sea coast."

With the Seaway rapidly taking form, lake ports look forward to building new port facilities, expanding warehouses and port services, and otherwise serving the needs of a large new commerce. Since 1946, about twenty Great Lakes-overseas shipping services have been established. During 1956 between 300 and 400 ocean sailings will be scheduled to world ports from Lake Erie, and a slightly smaller number of sailings from major Lake Michigan ports like Milwaukee and Chicago. The anticipations of the Great Lakes area have been whetted by the growing volume of ocean shipping services, linking lake ports with scores of ports in South America, the Mediterranean, North Africa, United Kingdom, the Baltic, and Western Europe.

In this respect, the Seaway is not mere future speculation, but is a working reality. Port authorities, warehousemen, stevedores, customs brokers, banks, freight forwarders, railroads, and truck lines in the lake ports are becoming familiar with the special requirements and techniques of ocean cargo. More than half a million tons of high-grade ocean cargo is moving in and out of Great Lakes ports through the present limited St. Lawrence route. Lucrative though it is, this traffic is considered only a forerunner of the golden harvest anticipated by lake ports, when the Seaway is fully operative in 1959 and in future years.

Authoritative traffic estimates indicate total seaway cargoes in the range of 35,000,000 tons per year, immediately after its opening in 1959. These forecasts include anticipated heavy movements of grain and iron ore through the St. Lawrence, with smaller volumes of coal, petroleum, fertilizers, and other bulk cargoes. Most authorities agree that the St. Lawrence Seaway will immediately serve about 5,000,000 tons of high-grade general cargo per year, which will rise rapidly, paralleling growth of population, industrial expansion, and other growth factors.

A competitive scramble among lake ports is already apparent. Port cities previously indifferent to the Seaway have been busy creating port authorities, retaining economic and engineering consultants, and drawing plans to remake their water fronts. With few exceptions, most lake ports are ill-equipped to serve the ocean general cargo trade, and principal emphasis is being placed upon the preparation of modern ocean terminals and cargo sheds to fill this gap. Milwaukee and Toronto have already expanded cargo shed capacity. Chicago has sold a bond issue of $24,000,000, and its new port facilities to serve seaway traffic are under construction in the Lake Calumet region. Milwaukee is rapidly awarding contracts for new port facilities to the value of $9,000,000, to expand its already excellent outer harbor development for lake and ocean ships.

Shipping authorities and economic studies indicate that two or three Canadian ports, and probably six United States ports, will be the major ocean terminal ports of the Great Lakes. It seems inevitable that ocean shipping services will primarily be attracted to the main centers of population, manufacture, and transportation, and will be unable to disperse their services to scores of small ports throughout the region. However, the smaller lake ports have high hopes for industrial expansion and for development of specialized services, such as ship repair and ship building facilities, which it may not be practicable to accommodate in the large industrial centers.

Turning from the economic projections for the Seaway, and looking again at its engineering aspects, the sheer magnitude of the project is apparent from a glance at some of the key statistics for the project.

Peak employment for the navigation and power job will be about 9750 men in 1957 and 1958. On-site employment will average about 6800 people for the five-year duration of the job and off-site employment will

be about the same. About 70,000 man years will be poured into this colossal undertaking.

The chief engineer of the St. Lawrence Seaway Development Corporation, Mr. Raymond F. Stellar, has estimated the material, dredging, and excavation requirements of the project as follows:

Earth and rock excavation	180,000,000 tons
Dredging (both seaway and power)	100,000,000 cu. yds.
Concrete	5,426,000 cu. yds.
Reinforcing steel	65,450 tons
Structural steel	47,000 tons
Gates and hoists	35,000 tons

(Plus large quantities of lumber, copper, rail and other materials).

Impressive as these figures are, and massive as any billion dollar engineering work is, one is even more impressed by the intricate engineering, administrative, and political coordination which the job demands.

At the top of the pyramid of coordination are the St. Lawrence Seaway Authority of Canada, and the St. Lawrence Seaway Development Corporation, the new entities created by the two National Governments to finance, build and operate the navigation project. Construction of the power project, which is intimately coordinated with navigation, is the responsibility of the Ontario Hydro-Electric Commission and the New York State Power Authority, with fringe participation by the Quebec Hydro-Electric Commission. The power project is licensed by the Federal Power Commission, with approval of the International Joint Commission of the U. S. and Canada, and the St. Lawrence River Joint Board of Engineers for both Governments.

The St. Lawrence Seaway Development Corporation has designated the U. S. Corps of Engineers as its design, contracting, and construction agency. The full resources of the Corps have been devoted to the project, to assure its expeditious completion.

These are the front line bodies whose intimate and harmonious cooperation is absolutely required to assure completion of the job on schedule. In addition to these front line agencies, there is the Canadian Department of Transport, the U. S. Department of Defense, U. S. State Department, and the two National Governments themselves.

Numerous consulting engineering firms are in the picture, along with scores of contractors and specialists of all types. Finally, is the basic job of marshalling thousands of men, thousands of pieces of construction equipment, and an immense flow of material to the various job sites.

Railroads and highways must be relocated and rebuilt. Cities and villages will be flooded by the great new power pool, involving relocation of farms, factories, villages, and even cemeteries.

The public may believe that the continental struggle between the white man and the Indian was long since settled. This is far from the case, as the St. Regis Indians are suing the State of New York and other parties for $30,000,000, for alleged damages and loss of land which will be absorbed by the Seaway project. The Seaway thus has its poignant human aspects, involving the compulsory transfer of people from loved homes and farms, some held by families for hundreds of years. It involves the moving of their dead, and the loss of familiar and well-loved features of their local landscapes.

However, objectors to the project are now few and far between. From Quebec City to the Rockies, interest in the Seaway is at an all-time peak. Earlier differences of opinion have been resolved by the enthusiasm for a great engineering undertaking, which will open a new frontier on a new seacoast. The Seaway, bitterly contested only two years ago, up until the recording of the last vote in the House

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of Representatives on May 8, 1954, is now accepted as an accomplished fact even by its former ardent enemies. New York banks, eastern utilities and eastern railroads are joining in advertising programs for promotion of the St. Lawrence River Valley.

Lake ports, once indifferent to the project, are now hard at work to capitalize on its potential profit and commerce. Management groups from the Atlantic Seaboard to the Rocky Mountains are asking what effect the Seaway will have on established patterns of trade, shipping, transportation, and industry. Industrial sites are being quietly optioned at key points, although nothing resembling a speculative land boom is as yet apparent. Planning for the project is generally highly optimistic, but firmly grounded on economic expectations and growth factors, which can be reasonably identified and analyzed.

The St. Lawrence Seaway and Power Project has been a long time on the way. It might be said that it started when Cartier, believing that China lay just around the river's bend, misnamed the Lachine Rapids. It might be said that it started in 1783 when the first primitive canal was built west of Montreal to by-pass the rapids of the St. Lawrence. It might be said that it started in 1832 when Mr. "A. Projector" wrote his essay urging a canal to link the Great Lakes and the sea.

For our purposes, however, it should be noted that in 1895, the United States and Canadian Governments appointed the first deep waterways commission, and directed it to report on all possible waterways which might connect the Great Lakes and the Atlantic. Accepting this forward step as the progenitor of the Seaway, we may conclude with some authority that the great engineering job now taking form in the St. Lawrence River Valley and in the Great Lakes was launched sixty years ago. This is a vivid example of making haste slowly, considering the rapid expansion of continental resources during the same sixty-year period. Many other major water resource developments were authorized by our Government and completed during this period. Only the St. Lawrence project, advocated by every President since Taft, encountered such a rocky road through American legislative halls. Never has a project been so enthusiastically advocated or so bitterly opposed by opposing transportation, economic, and regional conflict of interests.

Happily, however, the shooting is over and the shouting, already at high tempo, will reach a climax three years hence when the first ten thousand ton ocean steamer sails proudly into the Great Lakes from the high seas. On that glad day, the professional engineer above all others, will be entitled to put aside his responsibilities and to stand and contemplate with satisfaction one of the world's great monuments to engineering genius, which will harness for the service of mankind, one of the continent's greatest and most neglected resources.

For untold centuries, the waters of the Great Lakes have rushed to the Atlantic through the St. Lawrence River. This lost source of energy will light farms and factories and bring pleasure and profit to millions of people in two great nations which stand side by side as stalwart bastions of western civilization. The great ships which will move proudly along this new highroad of transportation will bind many nations and peoples more firmly together with the friendly bonds of trade and commerce. Once again the engineer has used his skill and science to change the face of the globe, to advance the welfare of mankind, and to serve the cause of world peace and amity.—***End.***

Ohio SPE Presents Certificates to 75 New Registrants

Approximately seventy-five Ohio Engineers and Engineers-in-Training of the Cleveland district, who recently passed the examination of the Ohio State Board of Registration, were presented their Certificates of Registration at ceremonies sponsored by the Cleveland Society of Professional Engineers, May 19, at the Cleveland Engineering Society Auditorium.

The Hon. Earl R. Hoover, Judge of the Cuyahoga County Common Pleas Court administered the Professional Engineers Creed.

B. G. Kesting, a member of the State Board of Registration, presented the certificates of Registration.

Representing the Ohio Society of Professional Engineers, Bruce Baty presented awards to area Engineers-in-Training high in their respective branches.

Hollis Receives Honorary Degree

Mark D. Hollis, assistant surgeon general and chief engineer of the U. S. Public Health Service, was recently awarded an honorary Doctor of Science degree by the University of Florida at the mid-year commencement exercises.

About the Author . . .

Mr. Brockel

Harry C. Brockel began his association with the Milwaukee Board of Harbor Commissioners in 1926. He served in various capacities and in 1936 was appointed secretary to the Board. Named Municipal Port Director in 1942, he was in charge of harbor administration and the development and operation of Milwaukee's municipal port facilities. During World War II he served in the Coast Guard Reserve, specializing in port security operations. Long active in promoting the St. Lawrence Seaway project, Mr. Brockel frequently appeared before congressional committees as an expert witness in transportation matters and harbor and waterway legislation.

In August, 1954, he was appointed by President Eisenhower as a member of the five-man Advisory Board of the United States Seaway Development Corporation.

He is a past president of the American Association of Port Authorities, a director of the National Rivers and Harbors Congress, and an officer and member of a long list of organizations in the Great Lakes area.

Professionalism

(*Continued from page* 16)

mimeographed newsletter which accompanies each pay check. Once each week the department heads meet, at which time the weekly progress reports are distributed and discussed, as well as all items of interest to more than one department. At the annual meeting a report is made to the employees, giving them the highlights of the past year, the amount of work that has been accomplished, the results that have been attained therefrom, and a brief discussion of those items which could have been done better, as well as words of encouragement for those things which have been done over and beyond the call of duty.

At least one measure of the success of the policy in encouraging professionalism is shown by the fact that of the men who are eligible for license by reason of education and experience, more than ninety per cent are actually licensed or registered. It is our belief that independence of thought and action is essential to the development of professionalism and whatever smacks of regimentation or imperialism will hinder its development among all who come under its influence.—***End.***

Exemptions Advocated To Stimulate Research

Elisha Gray II, president of the Whirlpool-Seeger Corp., has urged that the Government should encourage pure scientific research by industry through tax exemptions.

Speaking at the National Industrial Research Conference sponsored recently by the Armour Research Foundation of Illinois Institute of Technology, Gray proposed that the Government give special tax consideration to the development of scientific resources just as it gives such special consideration to the development of natural resources.

"Pure research," he said, "cannot be predicted as a profit-making endeavor, and therefore it does not contain elements which allow the ordinary type of management decision."

"As an interesting exercise in futility," he suggested, "picture yourself as a business executive trying to justify to a board of directors a request for an appropriation on which there is no reasonable expectation of return."

Gray told his audience that "in a technological age, science is our primary resource, therefore it seems both unrealistic and uneconomic not to place the tax incentive umbrella over science as well as mineral resources."

He emphasized that "it has been difficult to create the state of mind which is most conducive to the pure research scientist and engineer in a commercial profit-making business atmosphere."

ASTE Publishes Volume Of Technical Papers

The American Society of Tool Engineers has announced the availability of a library edition of a 524-page, leatherette-bound volume of its 1956 collected technical papers.

The volume contains 51 separate lectures, a panel discussion presented at the 24th annual convention of the ASTE in Chicago, two ASTE Research Fund reports, and a preliminary summary of the ASTE Automation Survey.

The volume is available at $4 to ASTE members, and $7.50 to nonmembers.

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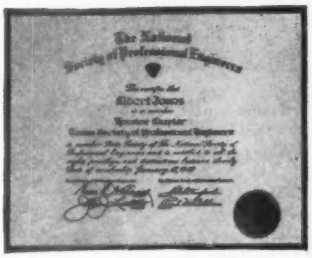

If you aren't among the hundreds who have already done so, now is the time to order several membership certificates. They are impressively done with your name, state and, if applicable, your chapter designation. Order certificates for your home and office today. Also available with Junior Member insigne.

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What's New

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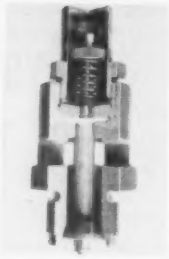
SPRAY VALVE ELIMINATES STICKING — Item 1



A new non-scaling spray valve with valve stem and guide sealed against liquid to prevent scaling has been introduced by Griggs Machine Co., Inc. Designed for feedwater heaters, deaerators, hot process water softeners, cooling towers, aerators, degasifiers, spray ponds, etc., the new D-J spray valve is so constructed that the valve stem, stem guide, and valve spring are inclosed in a liquid-tight chamber. Elastic sleeve permits free action of the valve and seals all moving parts from contact with the sprayed liquid.

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FIBRE CONCRETE COLUMN FORMS — Item 2

The Delta Co. has introduced a new plastic lined fibre form called DEL-TUBE for round concrete columns. The plastic lining reportedly releases "right now," does not adhere, and leaves a smooth dustless finish on the column. The body of the tube is constructed of plys of long jute fibre kraft. All plys are bonded with waterproof adhesive in addition to which the outer ply is asphalt saturated. The result is a strong, rigid, and water resistant fibre tube.

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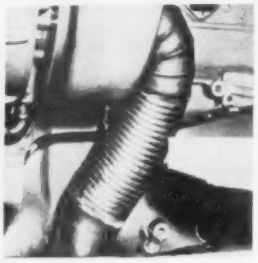
HIGH TEMPERATURE EXHAUST TUBING — Item 3



A permanently flexible, heavy-duty vibration-absorbing, corrosion-resistant stainless steel flexible exhaust tubing that is capable of withstanding constant exhaust temperatures up to 1250° F. without damage, has been announced by Universal Metal Hose Co. Available in two types. Both types are fabricated from Chromium-Nickel 302 Alloy Steel and designed to provide long service life with greatly reduced exhaust line maintenance costs.

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CALIPUTER — Item 4

A new and improved version of the Caliputer, a precision measuring and calculating instrument for engineers, scientists and even the family handyman, is now on the market. The stainless steel instrument combines the functions of a slide rule vernier caliper and vernier depthgage and computer in a single and inexpensive unit. Features an adjustable vernier scale which allows for easy maintenance and retention of accuracy. Purple enamel is used in the precision-edged scale lines for better light reflection and easier, sharper reading.

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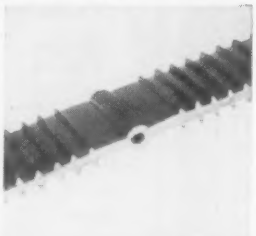
WATERSTOP JOINT — Item 5



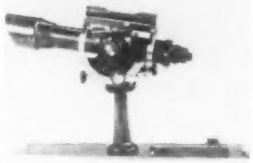
W. R. Meadows, Inc. announces production of their new "Durajoint" Waterstop and Expansion Joint. Extruded from a Thermo-Plastic material (Polyvinylchloride-PVC) suitably plasticized and supplied in long, flexible coils in widths from 2¼" to 9", "Durajoint" was especially designed to be used between adjacent sections of concrete structures such as tanks, channels, tunnels, culverts, swimming pools, walls, roofs, dams, etc. Resistant to acids, alkalis, weather, chlorinated water, lubricating oil.

This column describes new products of general interest to professional engineers. For further information, fill in the coupon provided and mail to the AMERICAN ENGINEER.

These listings are informational and are not an endorsement of the products, nor of the manufacturer's claims.

INTERNAL FOCUS IN STANDARD ALIDADE — Item 6

The Gurley Model 582-F Alidade, for making maps by the plane table method, now features internal focusing. The Standard Alidade, mounted on a pedestal, has a longer and higher-power telescope. Objective lens is stationary, to protect telescope from dust.



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GENERAL PURPOSE TIME SWITCH — Item 7

A new general-purpose time switch featuring greater reliability at less cost, has been announced by General Electric's Instrument Department. Suitable for indoor and outdoor use, the new heavy duty TSA-40 (replacing the T-27) will turn electric circuits on or off at any time of day. It can be used to control all types of street, sign, store and flood lighting, capacitor switches, heating, air-conditioning and refrigeration equipment, irrigation and pump devices, and many other types of apparatus where precise time control is necessary.

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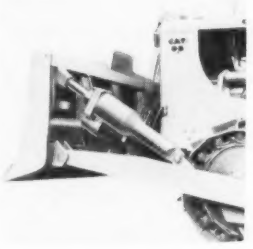
BULLDOZER TILTING ATTACHMENT — Item 8

A new hydraulically actuated bulldozer tilting attachment for use with No. 9S and 8S Bulldozers has been announced by Caterpillar Tractor Co. Designed to give D8 and D9 Tractors increased versatility on such jobs as ditching, pioneering roads on hillsides, digging rocks and other applications which require frequent tilting of the blade. Heart of the new tilting attachment is a large hydraulic cylinder which replaces the left bulldozer blade brace.



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IMPROVED VELLUM ERASES CLEANER — Item 9

Frederick Post announces an improved tracing vellum with better erasability. Called *Blutex*, the product is actually a revised formulation of an established vellum. Chief reason for the easier erasing qualities is a new combination of transparentizing materials used in treating the base stock. Blutex is treated with 100% synthetic resins. The carefully selected resins provide a "drier" working surface of unchanging characteristics. While dry, the paper is never brittle. This unusual dryness, combined with an extra hard surface, is said to permit faster and cleaner erasures.

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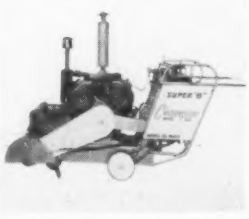
SELF-PROPELLED CONCRETE SAW — Item 10

New 36 and 25 horsepower self-propelled concrete saws have just been introduced by Champion Manufacturing Co. These saws feature direct chain drive, a new development in concrete cutting that purportedly eliminates all slippage, maintains constant torque. Other features include an automotive type muffler for more quiet operation, an easily removable unit mandrel, dual 14 or 18 inch blade guards, hinged blade guard visors for curb cutting and a variable speed self-propelling unit.



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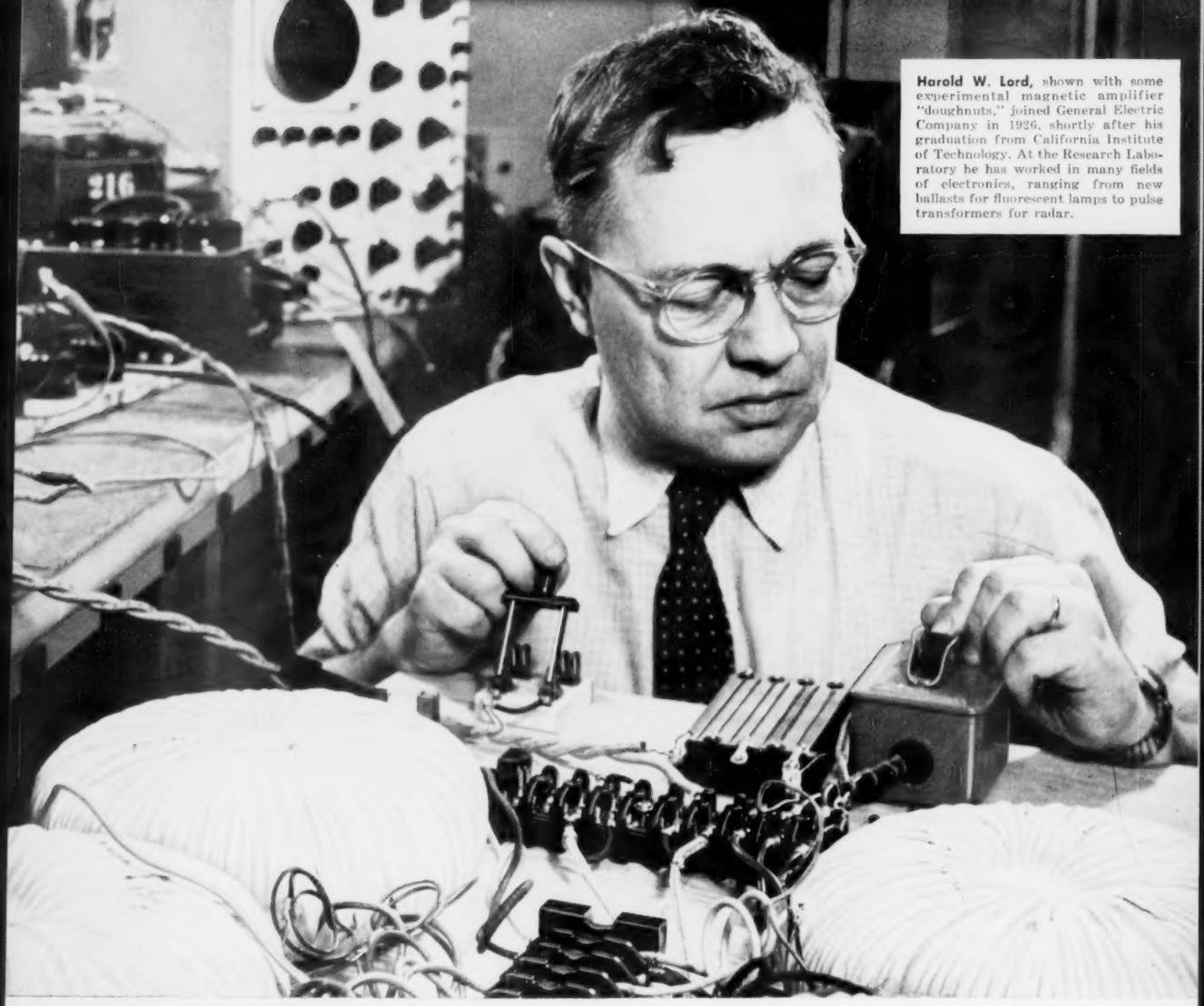

Harold W. Lord, shown with some experimental magnetic amplifier "doughnuts," joined General Electric Company in 1926, shortly after his graduation from California Institute of Technology. At the Research Laboratory he has worked in many fields of electronics, ranging from new ballasts for fluorescent lamps to pulse transformers for radar.

More reliable automatic controls

General Electric's Harold W. Lord helps improve magnetic amplifiers for industrial control devices

Automatic controls—for down-to-earth uses in metal-working machinery or for dramatic applications in autopilots for long-range bombers—are making new demands on *magnetic amplifiers*. At the General Electric Research Laboratory, where scientists have been studying magnetic amplifiers since 1912, new knowledge of the specific requirements of magnetic alloys and of their performance in magnetic amplifiers is making important contributions to this technology. New magnetic amplifiers are being designed with both higher amplification and greater stability at high temperatures. Significant progress in basic understanding of the behavior of magnetic materials in magnetic amplifiers has been made by Harold W. Lord. As a result of his work and of that of his associates, it should soon be possible to increase the reliability of servo mechanisms, voltage stabilizers, electronic computers, and other industrial control apparatus.

• • •

As General Electric sees it, providing individual scientists with freedom and incentive to solve the problems of research is part of solving the larger problem of how we can all live better, with better materials and better products with which to work, better jobs, and extra human satisfactions in terms of what people expect and want in life.

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